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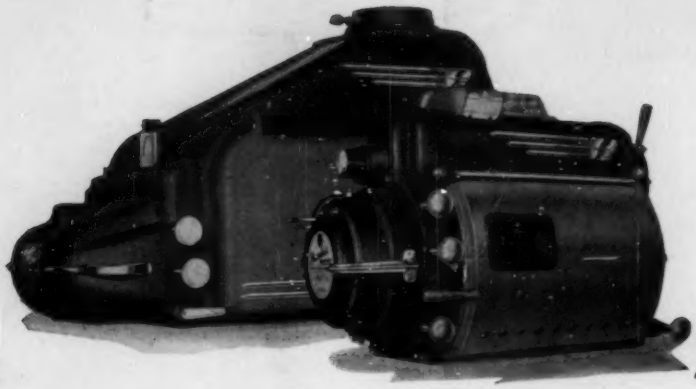

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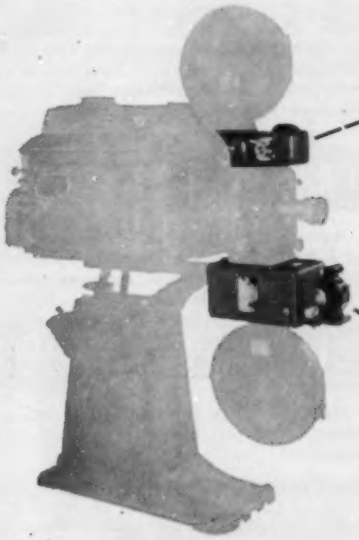

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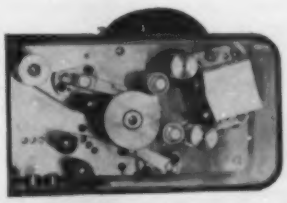

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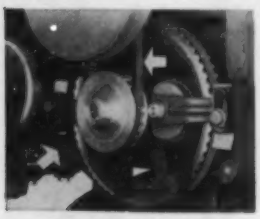

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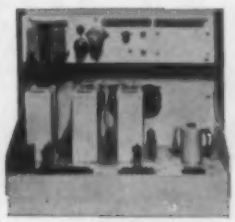

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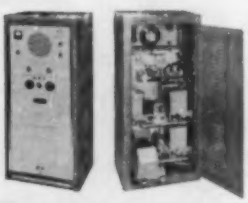

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JAMES J. FINN, *Editor*

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MONTHLY CHAT

TECHNOLOGY has finally come into its own—but does anybody in a responsible executive position in the motion picture industry render it anything but tux-and-black-tie lip service? These seem very inappropriate words, indeed, at this season of the year, but how much more inappropriate is it that those who are counting their blessings (financially) under the Yuletide tree forget completely those members of the technological branch of the industry (and their families) who have not worked for the past six months because of the unending avarice of those whose primary concerns are bank balances and earnings statements so proudly announced at directors' meetings.

The exacting demands of the various new projection processes was the topic of a recent gabfast by the writer with one of the top executives in the industry. Said he:

"Ours is a touch-and-go business which today is dependent in great measure upon the technological skills of our workers. True, no product is worth a nickel until it is sold; but the major emphasis in this business always has been and, I am afraid, will continue to be placed upon the purely 'selling' angle of a product which would not exist were it not the beneficiary of expert technological attention on both the production and exhibition fronts.

"The technological revolution began when sound movies bowed in 25 or more years ago; but then, resplendent in our isolated eerie as the purveyors of the world's best and least expensive form of entertainment to the masses, we translated this financial triumph *not* into technological research, the lifeblood of any industry from the look-ahead viewpoint, but rather into the ever more gaudy front for the showing of wares that even then, had we known it, were feasting upon their own vitals.

"As far as your fellows (projectionists) are concerned, I am constantly amazed at the unending war being waged by exhibitors to reduce projection room manpower—this in the face of the new and more exacting processes. I receive many letters each month which ask my opinion on this, that and the other aspect of motion picture showings.

"Most of these questions may be answered by the simple statement that the projectionist should stay continually at the operating side of his projector. Why?

"Because in my opinion the correct *presentation* process is the payoff in the industry today—and, also, because I am afraid that in this particular area we have used up all our margin for error!"

Let those who indulge in one-man shift forays stick the foregoing words against their ribs to provide warmth and comfort against the drab days which must inevitably follow this festive season.

★

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Season's Greetings

VOLUME XXIX DECEMBER 1954 NUMBER 12

Wide-Screen Presentation Magnifies Inherent Projection Defects

By ROBERT A. MITCHELL

The concluding article of two in which are discussed the problems incident to minimizing the exaggeration of inherent projection defects in wide-screen presentations.

PLAY between the star shaft and sprocket will also cause the sprocket to wobble and the picture to jump, hence the warning to projectionists *never* to use sandpaper or other abrasives on the starwheel shaft if a new sprocket seems to be too tight a fit. Oil on the shaft and patience invariably turn the trick.

The 6-cycle type of picture-dancing will occur if the four curved faces of the starwheel are not symmetrical. This slotted wheel, shaped like a Maltese cross, is the most delicate part of a projection mechanism. It is made of hardened chrome-nickel steel and finished to a maximum tolerance of only 0.04 or 0.05 mil in high-quality projectors, and to a somewhat greater tolerance (from 0.1 to 0.2 mil) in less precise machines.

But one of the most common causes of 6-cycle jump in projectors utilizing rotation of the whole intermittent movement for framing is uneven wear of the sprocket teeth. This particular cause of the troublesome 6-cycle dancing of the image is surprisingly common.

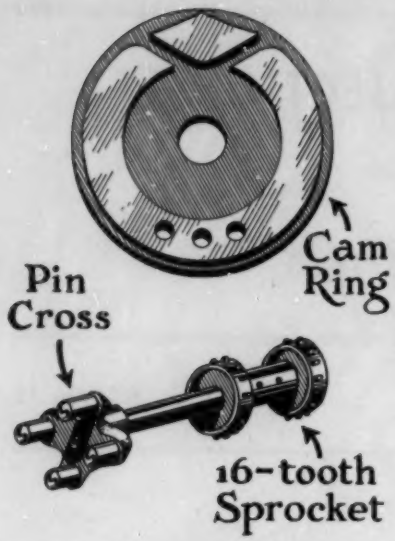
Varying Sprocket Tooth Wear

The wear and tear inflicted by the film on the teeth of the intermittent sprocket varies greatly from tooth to tooth. The teeth that engage the film perforations during *acceleration* of the sprocket are undercut, or notched, the most rapidly, while the teeth that pull the film during *deceleration* of the sprocket wear the most slowly.

And because of obscure factors, which may include slight differences in hardness over the body of the sprocket and accidental initial differences in the spacing of the teeth, the teeth on *one side* of the sprocket circumference wear faster than those on the other.

The worst effects of these unknown factors are usually seen only when the framer is changed from its customary position, as when the picture accidentally goes out of frame during projection, and has to be framed up or down to a different position.

Most projectionists keep the framing knob in its midway position to allow equal latitude in framing the picture up or down on the screen in case of misframe. When projectors having the rotational framing construction are operated for months or years with the framer remaining in this one position, unequal wear of the intermittent-sprocket teeth may



The Powers pin-cross intermittent movement. The diamond portion of the cam-ring imparts a quarter-turn to the pin-cross, after which the roller pins are again engaged and locked in an "at rest" position by the circular portion of the cam-ring. The three small holes in the cam-ring have nothing to do with the action, but they serve as the means by which the ring is strictly and dynamically balanced.

result in 6-cycle picture-jump when the framing position is changed.

Framer Interference

The writer has found that 6-cycle dancing of the picture may appear when the picture is framed either all the way up or all the way down. *The unsteadiness disappears when the framer is returned to its usual midway position* — a fact that rules out such other causes of 6-cycle jump as a warped starshaft, a damaged starwheel, and a lopsided or wobbling sprocket. If these other causes were present, changing the position of the framer would make no difference in the image-dancing. The cure is a new intermittent sprocket; and we do not recommend reversing a sprocket which gives evidence of this peculiar wearing of the teeth. Such a sprocket impresses us as a defective product.

This trouble is not known to occur in projectors such as the Motiograph AA in which rotational relation of the intermittent sprocket to film pull-down is preserved at all times by a framing device which moves the entire intermittent up and down, rather than around an axis, when the framing knob is turned.

The "up-and-down" type of framer requires an intermittent-sprocket shoe separate from the gate-door, while the "rotational" type of framer permits the sprocket-shoe to be attached to an apron at the bottom of the gate-door, a simpler and more convenient construction.

Unequal Sprocket Tooth Wear

Anent unequal wear of the intermittent-sprocket teeth on opposite sides of the sprocket circumference, W. Hecht of the International Projector Corp., manufacturer of Simplex projectors, warns against the use of sprockets of questionable quality.

"Assuming that intermittent sprockets are replaced, difficulty could easily occur if the parts were hardened *after* grinding. Any warping that may result from the hardening could alter the distance between teeth and introduce unsteadiness. On the other hand, Simplex sprockets are hardened *prior* to grinding to make certain that any errors caused by warping are corrected," stated Mr. Hecht.

Certain other American manufacturers of high-quality projection equipment harden their intermittent sprockets after grinding, however, and maintain that the steels from which their sprockets are made do not warp during the case-hardening process. This is a question best decided by experts in the metallurgical and manufacturing fields.

Admissible Picture Jump

According to generally accepted opinion among projection technologists, 6-cycle picture-jump interferes with projection quality to a noticeable extent when sprocket wobble or film mis-registration at the aperture exceeds 0.39 mil (10 microns). This limit represents a picture-movement of about 0.1 inch on a screen 13½ x 18 feet, the aperture being the standard aspect ratio of 1.37/1.

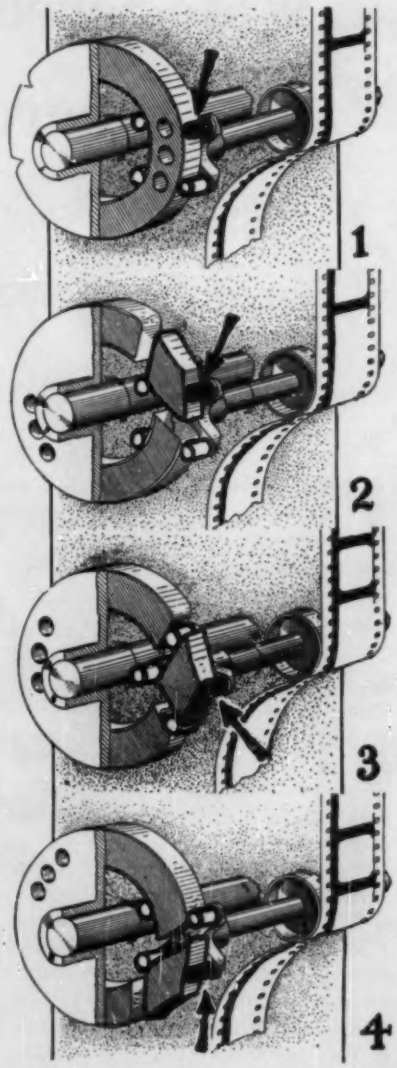
The stated limit of admissible 6-cycle unsteadiness is materially decreased by the wide-screen aspect ratios, as might be expected. To keep picture-jump under the 0.1-inch range on wide screens having a height of 13½ feet, mis-registration of the film must not exceed 0.33 mil (8.28 microns) when the aspect ratio is 1.66/1; 0.30 mil (7.62 microns) when the ratio is 1.85/1; 0.27 mil (6.88 microns) when the ratio is 2/1, or 0.22 mil (5.50 microns) when the ratio is 2.5/1.

It is to be noted that only intermittent units of the highest grade can be depended on to give pictures sufficiently rocksteady for non-anamorphic projection with 1.85/1, 2/1, and 2.5/1 aspect ratios—just one of several reasons why aspect ratios more extreme than 1.66/1 or 1.7/1 should be avoided in non-anamorphic 35-mm projection.

Projectionist's Maintenance Job

Even though the main responsibility for the proper functioning of the intermittent movement clearly rests upon the shoulders of the projector manufacturer, the projectionist is obligated to maintain this critical unit

How the pin-cross intermittent works. One of the four pins is shown in solid black for identification. Follow its action to see how the diamond rotates the cross and attached sprocket which, of course, moves clockwise.



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in the best possible condition. The most accurately made intermittent is subject to maladjustment, and the very hardest sprocket will wear out in the course of time.

Most projectionists dislike the job of changing intermittent sprockets when the intermittent unit is of the type which requires drastic dismantling for the completion of this otherwise simple task. The danger of misadjustment is feared, and unexpected delays in getting the projector in working order again are not too pleasant to contemplate. It is only natural to want to hurry the job; but haste is the chief cause of faulty star-and-cam adjustments.

European projector designers have made sprocket-changing so easy that many projectionists overseas remove the intermittent sprocket daily for routine cleaning of the mechanism. By the use of long starwheel shafts and sturdy inner bearings, the need for clumsy outboard bearings is eliminated; and by fixing the sprocket to its shaft by means of the end-screw and nut-and-bolt methods previously described, troublesome taper pins are also done away with.

With few exceptions, the latest American projectors also utilize constructions which enable the projectionist to remove and replace intermittent sprockets without the need of taking the entire machine apart. But many of the older projectors are still in use, and, accordingly, thousands of projectionists who prefer to do their own sprocket-changing must still go through the complicated ritual required by these old-time projectors.

Sprocket-Changing Procedure

The double-bearing movement used in the Simplex Regular and Super Simplex mechanisms is representative; and since it is necessary to remove the whole intermittent movement from the mechanism, and also to take the movement apart, a definite procedure is to be followed when changing sprockets.

At every stage of the operation the projectionist should have but one thought uppermost in his mind, namely, to guard against damaging the delicate and accurately made parts of the intermittent. And the sprocket, itself, is one of these parts.

The very first thing to do in the case of "Regular," "Super," and similar mechanisms is to open the film gate and remove the "spot" sight-box on the back of the mechanism. Next, the main drive-gear is taken out in order to disengage the machine mechanically from the sound-head. Finally, the mechanism is turned by the shutter-shaft knob to note the "feel" of the mechanism as the intermittent sprocket starts to move. This test should be repeated after the new sprocket has been installed and before the drive-gear is replaced, thus ascertaining whether the movement is properly adjusted for smooth running.

Step-by-Step Plan

Now to get the movement out of the mechanism.

1. Remove intermediate gear-shaft retaining collar. This item is under the lens shield, in line with the upper sprocket and crank-shaft. Turn the mechanism by hand until the set-screw in the collar faces the front of the machine, then loosen this set-screw by inserting a long screwdriver through the hole in the front of the mechanism-case.

2. Loosen the two intermittent-movement clamps (operating side) and push both clamps out of the way toward sprocket-shaft so that they no longer engage the framing cam-ring. Tighten screws lightly to hold clamps in this position.

3. Rotate the movement by means of the framing knob until the intermittent oil-tube (gear side) is in a position to allow the movement to be withdrawn from the gear side.

4. Grasp the intermediate gear in the left hand and the intermittent flywheel in the right hand, and withdraw both from the mechanism.

The movement may now be taken to the workbench for removing the sprocket. Remember that the intermittent casing contains oil, and that this should be drained out by removing the oil-drain screw. To change sprockets:

1. Remove film-stripper from sprocket bearing-bar.

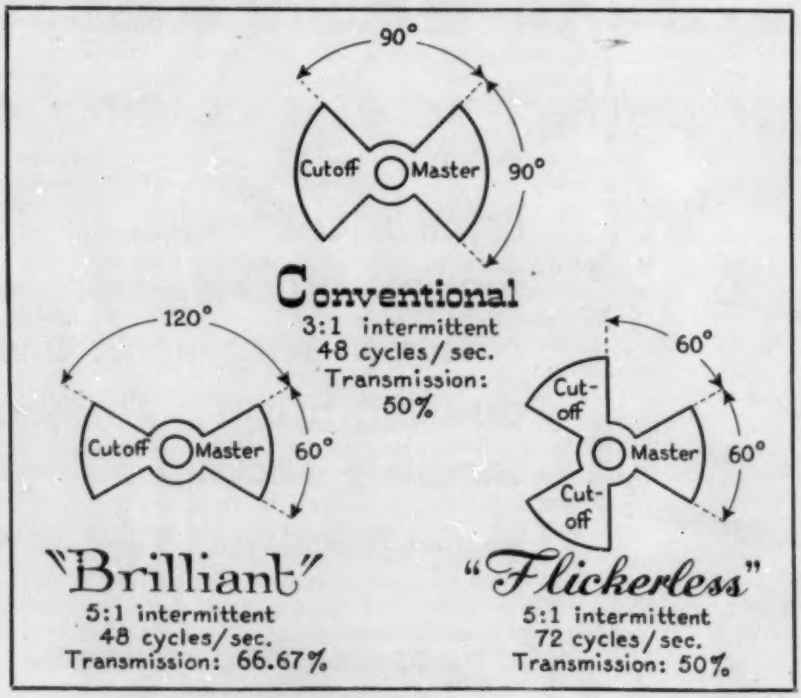
2. Remove the 2 clamping screws and the 3 or 4 retaining screws which hold the cover to the intermittent case. Pull the cover and associated star and sprocket assembly from the case very carefully to avoid scratching the surfaces of the delicate star-wheel. Lay the cover-gasket aside where it will stay clean. Then pour out remaining oil from case.

Note the location of the locating-pin on the case and the corresponding hole in the cover.

3. Remove the collar of the outboard

(Continued on page 47)

The two-fold advantage in shutters which can be used with 3-to-1 intermittent movements. The "Brilliant" shutter has the same periodicity as the conventional shutter—48 cycles per second—but transmits much more light to the screen, making the picture brighter. The "Flickerless" shutter transmits the same amount of light as the conventional one, but its high frequency—72 cycles per second—frees pictures projected at high light levels from annoying shutter-flicker evident with intense light at 48 cycles per second.



Born to be re-born
. . . again and again

Consider the star. The color negative captures her at her brilliant loveliest. Here, time for processing the film is a minor consideration. But in release prints she must be "re-born" in all her original beauty, again and again, at *money-making speed.*

To do this—faster—calls for meticulous attention to printing and processing . . . for color printing control systems, for example, that not only provide exposures at rates up to 200 fpm, but take care of scene-to-scene variations in negative density and in color balance.

Problems such as this are being solved by the industry. As a means of co-operating in all areas—especially in film selection, film processing and projection—Kodak maintains the Eastman Technical Service for Motion Picture Film. Branches at strategic centers. Inquiries invited.

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VistaVision Process on the Move

By LOREN L. RYDER

Research Director, Paramount Pictures Corporation

Another of the more interesting commentaries at the technological open forum held at the recent joint industry trade show in Chicago is the appended discussion of Paramount's VistaVision process of taking and showing motion pictures. Comment upon and inquiries about this process are invited.

VISTAVISION is a method of improving photographic quality by using larger negative images. We gain these larger images by running 35-mm film through the camera *horizontally*. The exposed area consumes 8 sprocket holes of film and provides an image 2¾ times the area of a standard negative.

Many types of prints can be made from these large VistaVision negatives. Paramount contemplates making only *three* types of prints:

1. Standard Release Prints

These prints will play with improved quality on existing equipment in any theatre anywhere in the world without spending a penny on new equipment.

A further improvement will be available in theatres that are equipped with large screens—and the best results will be obtained with good large screens and good standard projection equipment.

2. Anamorphic Squeezed Prints

These prints will be available for those theatres that desire anamorphic prints and have *variable* anamorphic projection lenses.

3. 2-Frame Horizontal Release Prints

These are the types of prints now being used in the presentation of "White Christmas" at the New York Music Hall and the Los Angeles Warners Beverly Hills Theatre. This type of print is only recommended for theatres with screens ranging from 50 to 150 feet in width.

We can also make prints for curved screens such as Cinerama, or TODD-AO—and we can make anamorphic prints of different ratios. This is a part of the flexibility of the VistaVision system.

Small-Screen Quality the Goal

In our VistaVision work, our No. 1 objective has been to gain the best possible quality for the greatest possible number of theatres *from 35-mm film run through standard projection equipment!* This we feel we have accomplished. It means hundreds of thousands—possibly millions of dollars—savings to the theatres throughout the world.

At the Paramount studios, it has been apparent that the picture quality in very large theatres, and on very large screens, is suffering by comparison with the picture quality in smaller theatres on smaller screens. I believe this applies to all processes. I know that the comparison becomes more apparent as the film quality is improved.

Our No. 2 objective is to provide the same high quality for large theatres as we supply to the smaller theatres. This is the reason for the double-frame film and double-frame projection for those theatres that desire it. It is also our opinion that double-frame projection can be of real help to drive-ins.

Choice of Film Size

We shall make tests of double-frame projection in drive-ins and will report our findings to the industry at large. Data indicates that by using the double-frame projector and projecting the first show on a smaller screen, it should be possible to open a drive-in theatre ½ hour to one hour earlier. Early patrons would be advised to locate close to the screen for best viewing of the smaller picture.

I have also been asked: "Why 35-mm film? Why not 70-mm, 65-mm, 50-mm film?" "Why did we at Paramount sell the 65-mm camera and projection equipment that we owned?"

The answer is simple and straightforward: we can project a better picture by the horizontal method.

The bottleneck of motion picture quality, and the greatest shortcoming in motion picture presentation is in projection. This applies to all processes: Cinerama, CinemaScope, the so-called standard projection, and VistaVision. I should also expect that it will apply to the Todd-AO process. This is not a condemnation of projection equipment, or the operation of this equipment, it is a statement of fact. We are now asking old-style *equipment* to do a bigger and more precise job.

Film Buckle Serious Problem

Most trouble is in film buckle, or pin-cushioning of the film in the projection gate. This buckle and pin-cushioning is caused by the rapid heating of the film by the projection arc. It is a progressive effect that is changing throughout the cycle of screen illumination making it such that film focusing is at present only a compromise. It is interesting to know that this effect does not exist on 8-mm film. It is just apparent in the projection of 16-mm film; it is bad on 35-mm film, and it is terrible on 65-mm film.

In standard 35-mm projection, the distance between the film supports is one inch. In the case of 65-mm film, this distance is increased to two inches. In the VistaVision process with hori-

The Story, "the Play" Is Still the Thing

It would seem that the proper time to take care of one's health is while healthy. By the same token, when we are prosperous, it is the time for prudence. There is no question but that the wide-screen in all its aspects is theatrical and dramatic and has stimulated the box-office. However, if we are not careful we will start making pictures *merely to fit the frame.*

Audiences will quickly tire of seeing the same picture over and over again under another title. We can very readily decide that unless we have thousands of extras and sets 20 mile long, we are not making today's movies. We need to get back to the fundamental principle of letting the story and *the story alone* predominate. Variety has always been an important word in entertainment.

DON HARTMAN

Production Department, Paramount Pictures Corp.

zontal projection, we retain the advantage of the one-inch support and, at the same time, gain the desired increase in picture area.

We at Paramount often hear this saying: that if the larger picture image of VistaVision is better than the standard image size, wouldn't a still larger image be even better?

Film Image, Depth of Focus

The answer is: No! As we increase the size of the picture image, we increase the picture sharpness in the plane of lens focus—*but* the increment of advantage from this increase diminishes very rapidly after the image size has arrived at the point where the picture quality is better than that which can be seen by the eye. As the picture size increases, the visible grain diminishes, but here, too, the increment of improvement diminishes very rapidly, after the grain size has been reduced to smaller than that which can be seen by the eye.

As the size of the image increases, the depth of the field of the lenses (depth of focus) diminishes. Therefore, the larger the negative image, the greater the tendency for the foreground and background to be out of focus.

In the VistaVision process we have increased the size of the negative image to the optimum point of picture improvement. If our computations are correct, all other systems will trend toward the Paramount image size.

Projection the Bottle-Neck?

Earlier in this discussion we mentioned the projection bottle-neck. Now we say, what are the reasons for this bottle-neck, and what can be done to improve this situation? We must first keep in mind that the old projectors were pretty adequate for the old photography, on the old postage-stamp screens. As the quality improves, especially as demonstrated by the VistaVision process, and as the screen size increases, new thinking and greater precision must be incorporated in these equipments.

The projection optics are mechanically lined up with the projection gate. This alignment does not comply with the offset picture image on the curved screen. This is the reason why

(Continued on page 46)

Air Blast, Water-Cooling Joined in New Conversion Unit for Simplex X-L

THE use of bigger screens in indoor and drive-in theatres presents in larger or more visible form any defects that may exist in the picture or the projection technique. One of the defects which has been known to exist is the slight loss in sharpness, caused by variations in the position of the film plane in the picture gate as the film buckles under the heating effect of the light passing through it.

Because of the larger screen, the actual light values have been increased thus causing the magnitude of the buckling effect to increase. Short-focal-length lenses, sometimes used to obtain the larger pictures, place even more stringent requirements on film positioning.

Conversion Unit for Simplex X-L

All these factors make it more important to use every technique known which will improve the stability of the film in the gate. One very promising technique, which the writer discussed in a previous issue of IP,† involves the use of air blown against the two sides of the film to accomplish the dual purpose of carrying the heat away from the film and constraining the film to remain in an essentially constant position during the projection cycle.

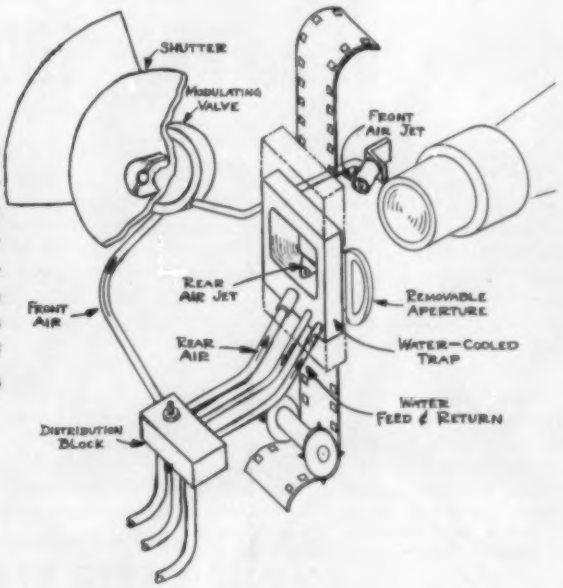
The work reported on earlier has been carried further, and there is now a conversion design for Simplex X-L projectors. In this conversion design we have three principal features:

First, is a continuous stream of air that blows against the film on the arc-lamp side. This air stream carries away the majority of the heat, and it also exerts a force on the film towards the lens in opposition to the usual direction of buckle. This would result in a reduction of the magnitude of the buckle observed, but it would not prevent a considerable variation in the *instantaneous* buckle during the exposure period.

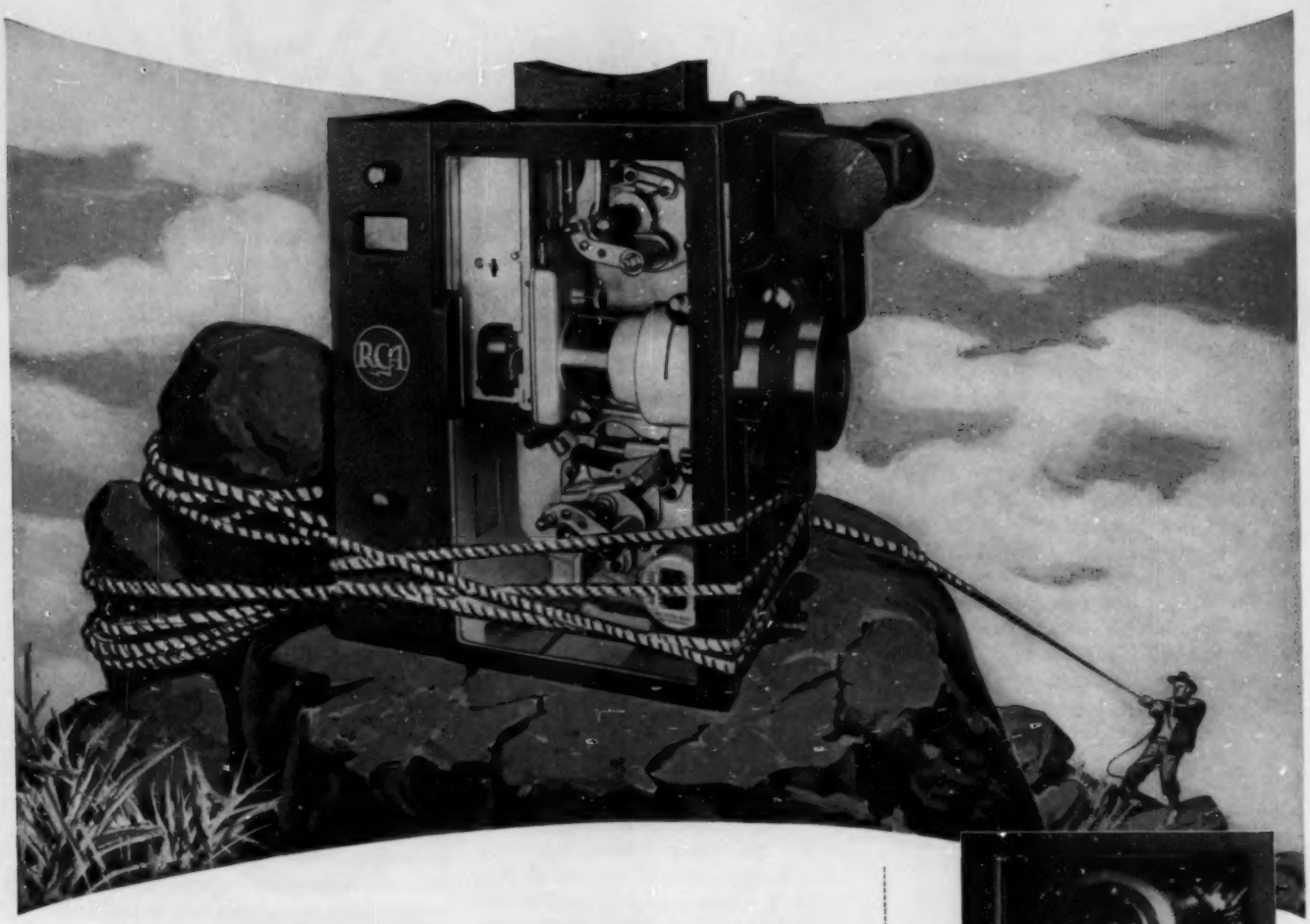
Second, a modulated blast of air, directed against the lens side of the film, which minimizes this variation in instantaneous buckle.

Third, a water-cooled film trap which carries heat away from all the metal parts surrounding the aperture. Modern arclamps with high light outputs and high-speed optical systems have a light-cone angle which makes the shielding of stray light by means of heat baffles very difficult. The water jacket absorbs the stray light and also shields and cools the rear air nozzle.—WILLIAM BORBERG, Chief Mechanical Design Engineer, General Precision Laboratory, Inc.

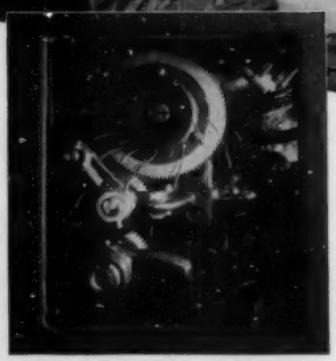
† "Modulated Air Blast for Reducing Film Buckle;" IP for October, 1952, p. 14.



Graphical representation of the new air-blast, water-cooling attachment for the Simplex X-L projector, which was designed following exhaustive tests to alleviate in great measure the enervating effects of high-intensity arc heat upon the film.



New film processes demand the "Rock-Steady" projection of an RCA "100"



AUTOMATIC LUBRICATION, famed long-life feature of the RCA "100" Projector, assures dependable, high-quality performance in drive-ins and indoor houses alike. Gears, shafts, bearings—all moving parts are showered continuously with oil for cool, frictionless operation. Dustproof gear cover keeps oil inside, dirt outside.

Screen images hold steady as a rock when any new-process film runs through an RCA "100" Projector. RCA, the name that's outstanding in projection *and* sound, engineers this superb projector with special three-way close tolerances. In the precision gear train, in all moving parts, in heavy intermittent movements . . . these close tolerances mean steady projection that's always dependable.

Of course there are more—lots more—big RCA "100" efficiency features . . . like automatic lubrication . . . wide mesh gear train to reduce mechanical load and wear in both starting and running . . . nylon pad rollers to eliminate all need for lubrication in the operating compartment. These and other RCA "100" exclusives keep maintenance costs right down to the barest minimum.

Flood-lighting in the film compartment of the RCA "100" assures fast, accurate film threading. Full view glass doors on both film and gear compartments allow an easy check on vital mechanism while projector is in action. And the extra light delivered by an RCA "100" gives all the sharp picture definition called for by larger, wider screens.

Across the country, drive-in and indoor exhibitors already know the advantages of RCA "100" Projectors for *every* film they show. RCA "100" performance, economy and long life can be *yours* now! See your independent RCA Theatre Supply Dealer for all the facts.

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The History of Studio Lighting†

The use of artificial light in motion picture production has followed a number of recurring cycles. Usually the carbon arc has been king. However, it sometimes has been replaced in dominance by tungsten. The following article traces the story of studio lighting from its inception.

By CHARLES W. HANDLEY

National Carbon Co.

THE ENERGY with which some people have attempted to reduce motion-picture set lighting to a strictly mechanical function indicates that the importance of light in motion-picture photography was probably not fully appreciated even by some of the people who depended upon the control of light for their livelihood.

A natural desire on the part of production units to simplify lighting to the extent of a pushbutton formula and to arrive at a Utopian position where pictures are made on a production-line basis has influenced historical trends in motion-picture set lighting. Some of these shifts have been responsible for major improvements in picture quality, while others, which were based on supposed economic gains alone, have often forced compromises with dramatic effect to the serious detriment of the finished product.

Dramatic Lighting

The film technician may desire a negative showing some detail in all shadow and highlight areas with most of the density range on the straight-line portion of the gamma curve. It is this desire for his own limited goal that has often encouraged him to extol the merits of flat light. The art director may desire sufficient overall density to insure an appreciation of the beauty of his set. But the director and cinematographer may be striving for a dramatic effect that fails to meet the desired requirements of either film technician or art director, yet does achieve the end result in that particular shot of affecting the senses of the theater patron in a manner which will forward the total desired effect of the story.

In the beginning, little thought was given to anything except a sufficient amount of light to provide exposure. Novelty effect took the place of dramatic effect. The motion picture was a magic lantern with movement, "just a passing fancy."

It is true that as early as the turn of the century, Thomas Edison built an experimental motion-picture stage which was mounted on a turntable so it could be rotated to follow the changing relative location of the sun. The infant industry, however, was in no position to try any costly experiments. As a matter of fact, where the cameraman helped to write the script, build the sets and even double in brass for all types of production work, there was little time for artistic expression.

Fortunately, as the motion-picture industry began to expand, there was a considerable number of people who saw the possibilities of the medium as a means for dramatic effect and the cameraman was one of the major leaders toward creating dramatic results that would entertain people by affecting them emotionally.

Only Sunlight Available

At that time in motion-picture production, sunlight was the only available light source and sets were photographed on open stages with muslin diffusers mounted on wires so they

FIG. 1. A Paramount picture photographed in 1939. Sunlight is the light source. Note the use of reflectors and circular scrim protecting some of the principals from overly strong shadow effects. Street set is rigged with canvas roof that may be pulled over to make closed set, if artificial light is used.

† Journal of the SMPTE, October, 1954.

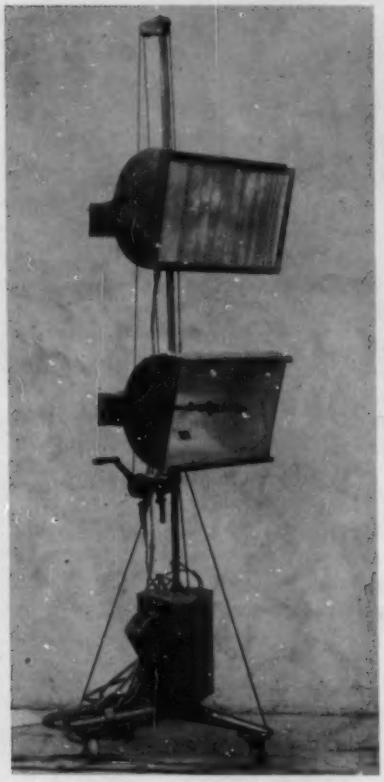

FIG. 2. An early type of solenoid feed carbon-arc floodlamp.

could be adjusted to control the light. Various types of reflectors were also used to redirect the rays from the sun and avoid heavy shadows on the faces of the characters and throughout the set. A wide assortment of translucent and opaque objects are still in general use to diffuse and control light (Fig. 1).

Color Quality To Fore

Because pictures were made in black-and-white, the question of color quality was not so important as it is today. However, the cameraman was handicapped by wide variations in intensity and position of his sunlight source throughout the day, and during inclement weather he was unable to work at all.

As a natural outgrowth of this situation, glass stages similar to large greenhouses were constructed and diffusers were installed as on the open stages. The reason for the glass stage was to permit the picture companies to operate during inclement weather; however, the advent of artificial lighting at about the same period made them obsolete and they were seldom used in the manner for which they were originally designed.

The advantages of working under artificial light were so great that most of the sets built inside of the glass stages were covered over with canvas, or other means were employed to exclude the natural light. Later, the glass panels were painted black so the natural light could not interfere with the controllable artificial illumination being used.

In the earlier serious attempts at set lighting the cameraman worked with old-type, street-lighting carbon arcs and banks of Cooper-Hewitt mercury tubes placed directly overhead and at angles in an attempt to obtain a flat, diffused light all over the set. Cooper-Hewitt mercury lamps were installed in the Biograph Studios, New York, as early as 1905. Overall exposure requirements, lack of adequate equipment and economics made anything but flat lighting difficult, if not impossible, to attain.

Powerful Lights Required

It was known by the cameramen that added interest, improved perspective, increased illusion of depth and much greater dramatic effect would be obtained if they could skillfully utilize powerful light sources that would give them the effect of a one-source lighting such as could be obtained from the sun under ideal conditions, but the industry had not yet attained the position where such specialized equipment could be properly designed and made.

The time finally arrived when the public had accepted the silent pictures and fortunes were being made in production. This brought competition, which in turn opened the door for the cameraman to take some chances, to try anything he could get his hands on, to use his creative ability without fear of sudden replacement by a penny-wise management. In 1912, white flame carbon arcs replaced the low-intensity enclosed arcs at Biograph.

One of the cameraman's first demands was for a controllable light source that would give him twice the power and twice the penetration capacity of anything he had. His only source of equipment was to follow precedent and adapt from other fields as had been done with the street-lighting carbon arcs and the Cooper-Hewitt mercury banks.

Origin of Term "Klieg Light"

Carbon-arc floodlamps, better adapted to floor lighting than the other equipment, were obtained from the graphic-arts and still-photographic fields (Fig. 2). Carbon-arc spotlamps were purchased from the theater-projection and stage-lighting fields. Such lighting equipment companies as M. J. Wohl & Co. and Kliegl Bros., of New York, turned their attention to motion-picture studio lighting equipment. It was from the name Kliegl that the "Klieg-light" originated. Even the military searchlight was adapted for use where a greater amount of light was needed (Fig. 3).

The status of the cameraman improved with his increased ability, from both the equipment and economic angle, to show what could be done with light and his title was changed to Cinematographer, or Director of Photography.

Because they could be placed where the carbon arc could not, and because

(Continued on page 40)

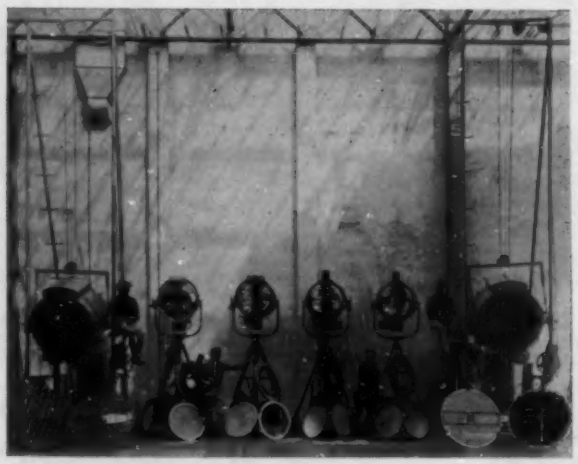

FIG. 3. "Sunlight" arc lamps — 24- and 36-inch — popular during the 1920's and early 1930's. This equipment was adapted from the military searchlight.

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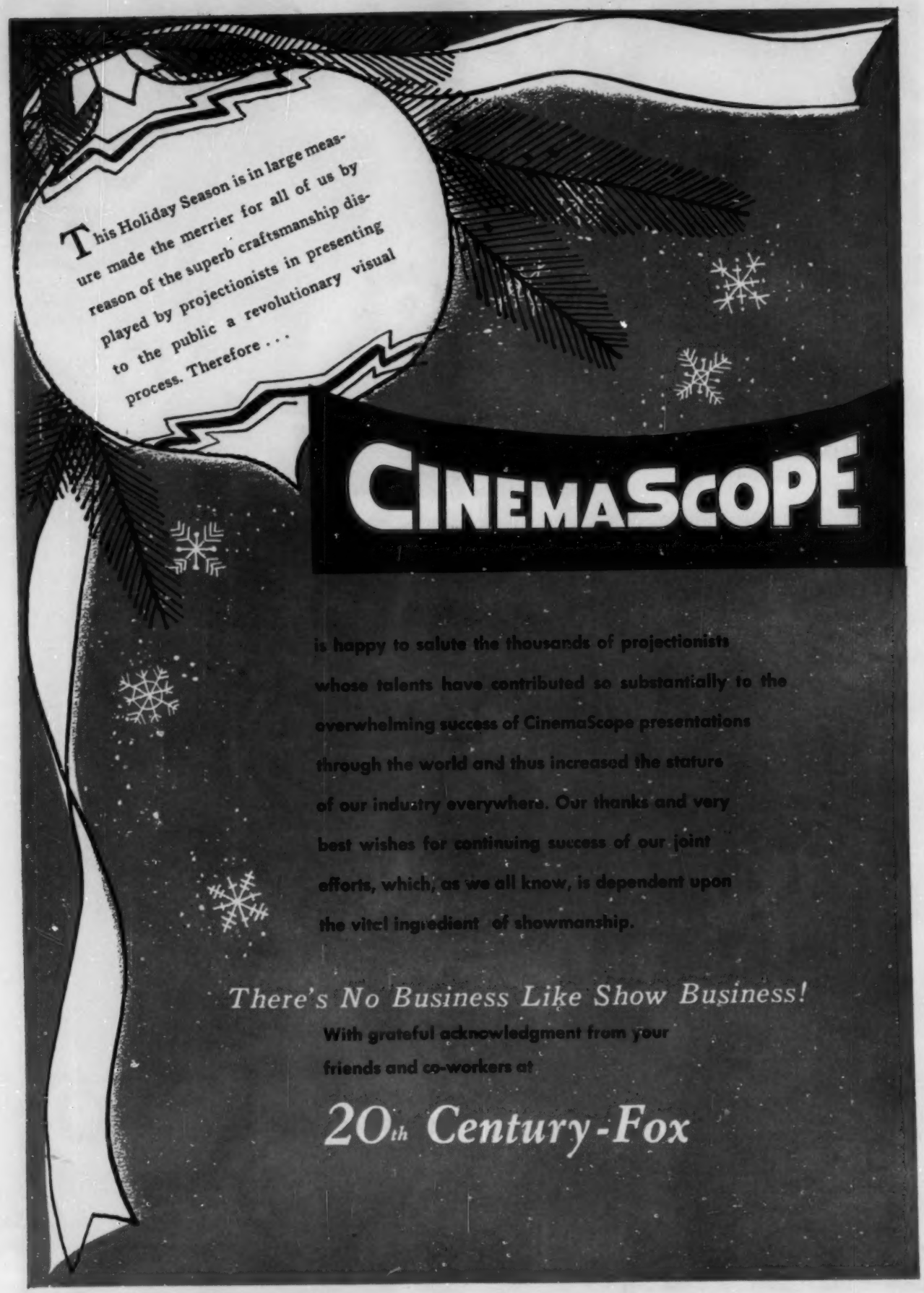
This Holiday Season is in large measure made the merrier for all of us by reason of the superb craftsmanship displayed by projectionists in presenting to the public a revolutionary visual process. Therefore . . .
CINEMASCOPE
is happy to salute the thousands of projectionists whose talents have contributed so substantially to the overwhelming success of CinemaScope presentations through the world and thus increased the stature of our industry everywhere. Our thanks and very best wishes for continuing success of our joint efforts, which, as we all know, is dependent upon the vital ingredient of showmanship.
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With grateful acknowledgment from your friends and co-workers at
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This Matter of Correct Screen Surfaces

One of the more interesting expositions at the recent giant trade show in Chicago was the offering by Leonard Satz, Raytone Screen Corp., excerpts from which are appended hereto.

THE problems of the screen manufacturers are closely interlaced with those of the lamp and optical manufacturers. More and more light is the cry today. Wide screens and various wide-screen techniques require more light because the available illumination is spread over a large area, thus the screen tends to have less brightness. The ways in which we can make more light available are:

1. To increase the output of the light source.
2. Increase the brightness of the screen.
3. A combination of both 1 and 2.
4. Improved optical designs — not only in the lens or the method of presentation — but also in the arclamp and projector.

Leonard Satz

Theory—Practicality Clash

We all know that, theoretically, faster lenses can help this problem, but if the light from the arc is not *correctly directed* through the projector aperture, the faster lens cannot be used to best advantage. Another thing to remember is that all things are not obtainable in optics. The faster the lens, the more likely there will be poor definition at the extreme sides when short focal lenses are used.

The past year has proven one thing in particular to me as a screen manufacturer: the great majority of exhibitors demand a metallic screen that has perfect uniformity of surface *above all else*. Brightness and light distribution must also be provided in good balance.

Lately it has been suggested by some that white screens are good enough for wide screen techniques, that they give better distribution of light to the sides. Certainly, they diffuse light efficiently — not only to the sides, but to the ceiling and floor as well. To assert that such a screen should be used for every type of projection is illogical.

Such a surface puts a very large percentage of its reflected light where it is either difficult to seat patrons, such as the extreme front sides, or impossible to seat them, such as on the ceiling or on the stage floor. It follows, therefore, that such reflected light is totally wasted.

Varying Conditions Requisites

I do not mean to infer that nothing can be done about it. The equipment manufacturers are constantly striving to improve every facet of motion picture theatre projection and sound. There is a correct screen and correct equipment for every theatre. Situations will vary, of course, but most of the answers are available. All factors applicable to a given situation must be weighed carefully *before* the purchase and installation of the equipment.

The writer suggests the use as a guide of the recommendations and reports of the SMPTE and the Motion Picture Research Council. A few years back, a survey conducted by the SMPTE indicated that the majority of theatres in this country were sub-standard and did not have 9 to 14 foot-lamberts of reflected light on their screens (mostly white screens).

The average theatre today can meet those standards *if* it uses a high-gain metallic screen and an adequate light source with wide-angle techniques. It does not meet these standards on a white sheet unless the light output has been greatly increased in the projection room.

Another point worth remembering: assuming we have an adequate given amount of light at the arc, say, 70 amperes, a 40-foot-wide metallic screen *can* reflect 9 to 14 foot-lamberts back to the largest seating area of the theatre, represented by a quadrant of

Reflection vs. Refraction

While with spherical mirrors light, is reflected according to the laws of reflection to an approximate focus (we shall see later why the focus is never exactly a point) lenses make use of a different property of glass, called *refraction*.

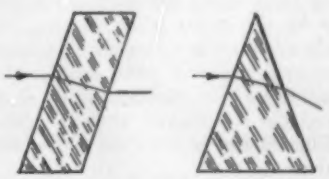
Refraction simply means *bending*. Whenever a ray of light passes at an angle from one material into another of different density—air to glass, glass to air, water to air are the three most common examples—it is bent or refracted.

Here is a simple way of understanding what happens. Suppose a number of soldiers are marching in line abreast, and they step off a hard smooth surface the edge of which is at an angle to the line of march, on to some sticky muddy ground (Fig. 1). As each man steps off into the mud he will be slowed down, and gradually the right-hand men will get more and more behind (sketch *b*). Eventually the line of soldiers will be marching at a different angle.

Passage of Light Depicted

The same thing happens with light. A ray of light which has been passing freely through air suddenly comes to the surface of a block of glass through which it cannot move so easily. If this glass surface is at an angle to the direction of the ray (Fig. 2), then the ray will be bent. If our piece of glass is flat (*a* in Fig. 2) it will straighten out again after it has left the glass. But if the glass is in the form of a

FIGURE 1



A B

FIGURE 2

prism, there will be a second bending or refraction when the light reaches the farther side of the glass, just as there would be if our line of soldiers came to the end of the patch of mud. When the light emerges from the prism it will be travelling in a different direction (*b* in Fig. 2).

R. H. CRICKS, *Ideal Kinema.*

60° from the center of the screen. True, beyond this 60° quadrant — on either side — the reflectance will fall below the 9-foot-lambert minimum; *but* the same arclamps could not return any more than 7 foot-lamberts (probably less) from the *center* of a 40-foot-wide white screen, and less at the sides.

Thus, the comparison at the sides of the theatre is equal and unsatisfactory with either type — but far superior with the metallic screen for the greatest number of desirable seats.

Curvature of the Screen

Now, a word about curving the screen. Knowing the reflectance characteristics of our screen . . . which are typical of certain others . . . we recommend a curvature equal to the radius of the throw. It improves the light distribution at the sides of the average auditorium. We also recommend, in balcony houses especially, tilting the screen backward slightly. This will balance the reflection of light between the balcony and orchestra.

The drive-in theatre problem is essentially the same as the indoor theatre. Results, however, are mostly sub-standard—something on the order of 4 foot-lamberts of reflected light because of the very large screen size. But because the screen area is so very large, we accept the results. The human eye is a remarkable optical instrument: visual acuity, or the ability of the eye to perceive details, improves as the size of the image increases.

More light is needed. More light will be made available as the equipment industry progresses. Another year I am certain, will bring about definite improvement in equipment and procedure.

Herewith an interesting question from the floor, and the answer thereto by Mr. Satz.

QUESTION: Do you recommend that I curve my drive-in screen tower?

ANSWER: Yes, I do. For the reason that both indoors and out a specular or semi-specular type of surface will give better distribution of light at the sides of the arena or auditorium.

Curving is not for the purpose of creating an illusion of depth. It is possible that one of our optical experts might give us an opinion on curving a screen as far as optics are concerned. It is possible that they may disagree with the theory of curving a screen.

It is my opinion, and in this regard I agree with the remarks just made by Mr. Sponable, (research director for 20th Century-Fox), that screens should be curved *indoors and out* on a radius equal to that of the projection distance. Improved screen surfaces of the future will probably require a slight curvature.

Kit Modernizes Simplex E-7, Super Heads

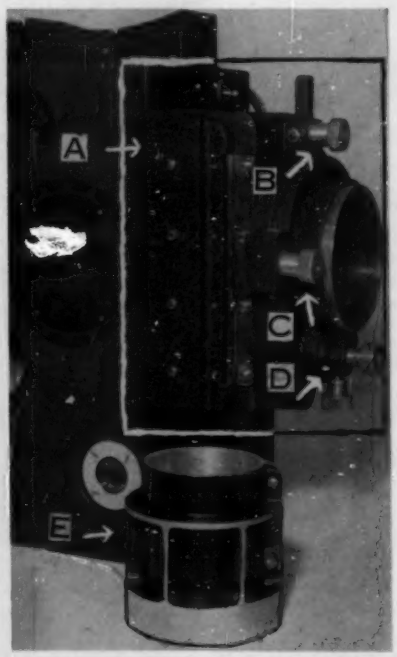
A reasonably-priced conversion kit to better adapt the Simplex E-7 and Super projector heads *only* to the new processes has been marketed by the Bizzelle Cinema Supply Co., 420 West 45th St., New York City. The combination face plate and lens carriage provided in the kit makes it possible for these mechanisms to take 4-inch lenses, and also provides for horizontal and vertical adjustments of the lens carriage so that the procedure for switching from CinemaScope to non-anamorphic projection is greatly simplified.

According to C. P. O'Grady, vice-president of Bizzelle Cinema Supply, the modification device, known as the Cinecenter, which is contained in the kit, can be installed either by a serviceman or by the projectionist himself. It is only necessary to follow simple directions for removing the front cover and the standard 2 25/32-inch lens carriage from the mechanism. Then the new attachment can be installed with a screwdriver.

Simple Installation Operation

The accompanying illustration shows the attachment mounted on an E-7 projector head. Arrow A points to the entire Cinecenter attachment. Arrows L and C point to the vertical and horizontal adjustment locks for changing the position of the lens. Arrow D shows the focusing knob and lock of the new lens carriage. Arrow E at the bottom points to an extra adapter that permits the projectionist to use a small diameter lens in the larger carriage whenever necessary.

While all makes and focal lengths of 2 25/32-inch diameter lens can be used with the extra adapter provided, not all four-inch diameter lenses can be used because of the limitation in the distance between the optical center and center frame of the E-7 and Super. The Kollmorgen four-inch lens will fit because the rear of this lens narrows in a series of steps allowing it to pass the obstruction. In addition to its other features, the Cinecenter is said to prevent vignetting which sometimes occurs when extremely short focus lenses are mounted in older projector heads and part of the beam is blocked by the mechanism.



The Cinecenter attachment is shown above enclosed within the black-and-white rectangle and installed on a Simplex E-7 mechanism. A four-inch Kollmorgen lens is mounted in the Cinecenter carriage. Features indicated by arrows are explained in accompanying story.

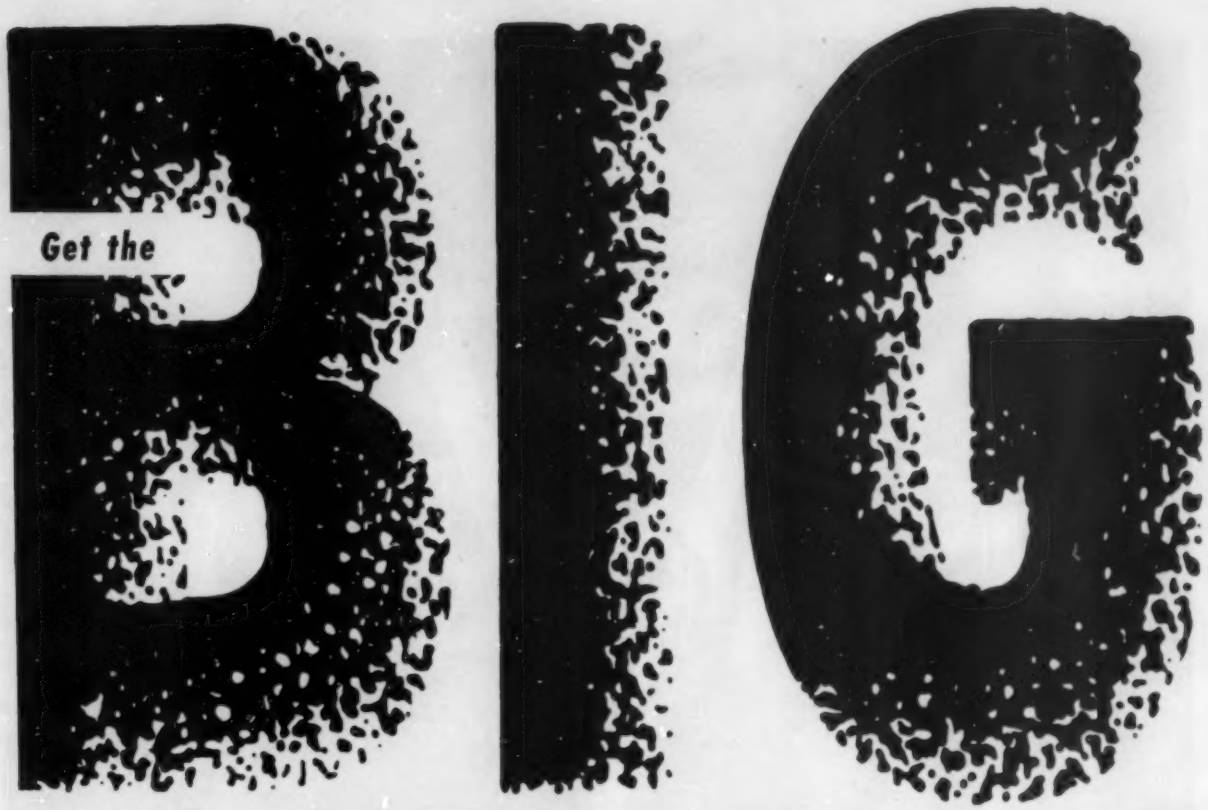
2,010-Car Drive-In Planned

Despite efforts by the Hartford, Conn., city council to halt plans for the construction of what is described as the world's largest drive-in (2,010 cars) in that area, a green light has been given.

Both a majority of the council and the city's planning commissioner were unable to find any legal basis for halting the venture so that the area could be used for a more tax-productive industrial development. The prospective builder of the giant drive-in is A. J. Bronstein, who operates other drive-ins in Connecticut.

Local Taxes Hurt Theatres

Local taxes imposed on the nation's theatres are draining off a minimum of $36,000,000 annually, according to a report from the Committee of Motion Picture Organizations.



PROJECTION ARC LAMP

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Be sure to get the lamp that is readily adaptable to all types of modern screen presentation.

National's Reflect-O-Heat unit permits the great increase in volume of light at the mammoth new screens, without a corresponding increase in heat at the aperture.

The Automatic Crater Positioning Control System insures that both carbons are so fed as to maintain a correct arc gap length and to keep the position of the positive crater at the exact focal point of the reflector. Thus, throughout the presentation, the screen light is always of the same color, without variations from white to either blue or brown. The projectionist is accordingly freed from the necessity of constantly supervising the arc so that he can devote himself to the care of other technical features of projection which are not on an automatic basis and which require continual attention.

The arc is stabilized by a stream of air which maintains a prescribed system of ventilation of the area surrounding the arc. This air jet prevents the hot tail flame of the arc from reaching the reflector, supplies enough oxygen so that no black soot is produced, and keeps white soot from collecting on the reflector in such quantity as to absorb heat which would cause breakage.

Unit construction permits easy removal of the elements for inspection in servicing.

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The marked increase in theatre attendance which VistaVision has already contributed to the economic welfare of our industry can be extended only thru the best efforts of producers, exhibitors and projectionists working together toward its perfect presentation to the public.

This concluding article of two sets forth in down-to-earth fashion the problems confronting the optical designer in computing, making and delivering a product which, hemmed in by all the normal restrictions of the projection process, will deliver to the screen the sum total of entertainment value contained in the print which is delivered to the theatre for ultimate consumption.

Elements of Optical Condensing Systems

By A. E. MURRAY
Scientific Bureau
Bausch & Lomb Optical Co.

AN attempt is often made in motion picture projectors to reduce the amount of "spill light" at the long sides of the gate by using a cyclindrical surface with horizontal axis on one of the condensers.

With the proper distribution of power in the condensing system, this will produce an elliptical spot with the minimum spill of light. With a diffusing medium such as film in the gate, this technique leads to greater uniformity as well as more useful flux flowing through the gate. Optically, the round arc image is flattened the better to fit the gate, and two real images are produced of the arc (images elliptical in shape) at right angles to one another and differently situated on the axis.

Theoretically, with point sources and with perfect condensers, this would mean that since only one source image could be placed at the gate, the other image falling either before or behind the gate could not match the *f* number of the objective, thus light would be either wasted or the full potentialities of the objective would not be used. The condensers obviously have two different *f* numbers in the two meridians.

Condenser Design Requisites

In practice, however, arc craters are of finite size, and because the film is diffusing and thus can even out the *f* number discrepancy—and more cogently, because no system is perfect—spherical aberration introduces enough complication that a real gain seems to be found.

The imagery demanded of condensers is not of the same order of magnitude as that required of photographic or projection objectives, but still the requirement that they deliver the maximum flux in use calls for careful design. Condensers are not required to image very large angular fields, *i.e.*, they must work close to the axis, so it is possible to achieve satisfactory performance with relatively few surfaces, and the aberrations of the oblique pencils have relatively little weight in their design.

Spherical Aberration Effects

It is clear that in the case of a point source, with either arrangement of source image, in the gate or in the projection lens, spherical aberration in the condensers leads to impaired efficiency. Spherical aberration is that behavior of centered systems, not necessarily consisting of spherical surfaces, characterized by differing focal points for the various zones of the system. Those rays traveling close to the axis will find their focal point at a different position on the axis in the image space than the rays which are incident near the margin of the system, or points between.

If the paraxial (region near the axis) focus of the condensers is placed in the gate or in the lens, it is easy to see that the rays from the margin are likely to miss the projection lens, thus wasting in severe cases some of the periphery of the condensers. On the other hand, if the primary thought is given to the placement of the peripheral marginal or zonal image, the paraxial image may fall too far out of line to be effective and cause intolerable lack of uniformity.

How Light Is Wasted

At its worst, spherical aberration with point sources produces an indeterminate region along the axis through which the source is imaged by the various zones of the system, together with unevenness of illumination and waste of useful light.

The same objections apply even more cogently to sources of finite size. Each point of the image is afflicted, and instead of a clear-cut, well-defined image it is either sharp with a large amount of general haze spread far outside the boundaries, or very fuzzy and ill-defined with poor evenness of illumination. In either case, a limit of utility is soon reached.

Spherical aberration is a function of the aperture of a system, increasing rapidly as it becomes greater. It is this spherical aberration which sets a limit to the solid angle of the collected cone of flux in a condenser, for always the system must be usable.

Spherical surfaces cannot deliver efficiently the quality and quantity of flux required by modern objectives, so resort is had to those surfaces which

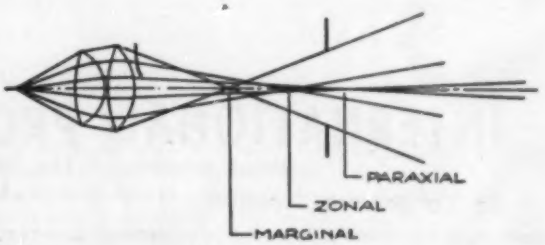

FIGURE 7.
Spherical correction. This illustrates simple undercorrection wherein the marginal and zonal foci are closer to the lens than the paraxial.

will permit higher solid angles and better definition of the source in motion picture projection with fast lenses.

A single spherical surface, and in general a simple system of such surfaces, acts as though it possessed too much refractive power toward its margins, or too little close to the axis. This might be remedied by the expedient of diminishing the curvature of the zones in just sufficient amounts to compensate the excess power. Mathematically, this is easy to do, the surfaces required in the general case having been worked out by Rene Descartes some 350 years ago.

These surfaces are in general not practical or economical, and as far as the practicing optical engineer is concerned are but curiosities, with the exception of the elliptical mirror to be considered in its place.

Combatting Spherical Aberration

In general, each pair of conjugates, or object and image distances from a given surface, requires a different Cartesian surface, both in reflection and refraction. Fortunately, there is an approximation in refraction which in

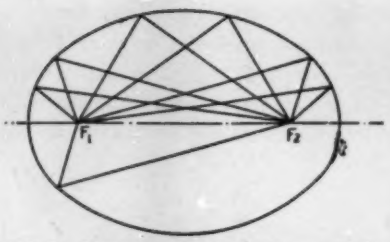

FIG. 8. Illustrating the focal property of the ellipse. Any fan of rays, of arbitrary solid angle with apex at one focus, is imaged at the other focus with no spherical aberration. This is true only for point sources.

combination with spherical surfaces will provide a greatly diminished spherical aberration. These parabolic surfaces find wide application in condensers.

The techniques for producing parabolic surfaces in the shop are comparatively simple, and they can be produced in large numbers. While such surfaces are not always the answer to condenser problems, from practical considerations their properties are used in answer to specifications where spherical surfaces could not perform.

Because of the loss of curvature toward the periphery, and thus diminished power, the spherical aberration in refraction of parabolic surfaces is considerably improved over spherical surfaces of equivalent power, even at finite conjugates. For this reason, considerably better light-gathering power is possible with such surfaces.

If we were confined to spherical surfaces exclusively, condensing systems would be as complex as projection objectives, and many more surfaces would have to be used, with the consequent loss in transmission.

Aspheric Condensers Promising

Aspheric condensers have been exclusively parabolic for the aforementioned practical reasons, but there is nothing to prevent the use of other aspheric forms, if required by physical considerations. Indeed, with the skills gained in the production of such outlandish surfaces as Schmidt corrector plates, it is not at all unlikely that the next direction of advance in condenser design may be toward aspheric surfaces designed specifically for a given application. Before this can happen, however, there will have to be a sufficiently large demand to justify

Holiday Greetings

It has been our privilege throughout many years to be intimately associated with a group of craftsmen who through their inclusive knowledge of the exacting demands of showmanship have realized the full potentialities of the fine projection equipment we have provided. The phrase "Better Projection Pays" was never better demonstrated than in the close technical and fraternal relationship which has existed between our groups these many years.

The best of everything for this Holiday Season and in the days to come—and our best wishes for the continued progress of our industry and the advancement of our mutual interests.

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both development and production costs, for such surfaces will have limited use.

So far our discussion has been limited implicitly to condensing systems comprised of lenses—refractive systems. Reflective systems comprise one of the largest and most important groups of condensers in use today. Mirror systems have a great advantage in weight and in the fact that potentially, at least, the reflective and absorptive losses are less, though this factor is minimized by the fact that in arc lamps and single mirror surface is apt to tarnish and to need replacement rather frequently.

Elliptical Mirror Properties

A very curious property of an ellipsoid of revolution (the solid figure created by the rotation of an ellipse about one of its axes) is its ability to bring to a focus *all* the rays emanating from a point at one of foci of the ellipse. The two geometric foci of an ellipse in reflection are optically conjugate, and a point source at one is imaged at the other by arbitrarily wide cones of light, and *without spherical aberration.*

This property of elliptical mirrors is very useful, for they can be made to collect solid angles much greater than possible with lenses, and to image the source, which must be comparatively small, without loss of light accurately where needed. This useful characteristic of elliptical mirrors applies only to the geometric foci and to small regions about the axis, so they are employed only with arc sources, where they collect more flux, but are less flexible than lens condensers.

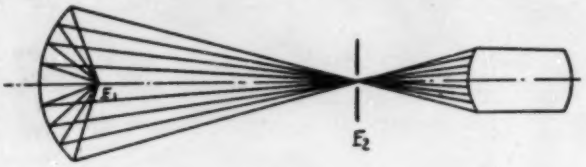

FIGURE 9.
The elliptical mirror used as a condenser.

In many incandescent filament condensing systems a spherical mirror is used to collect light which otherwise would be lost. The mirror is placed with its center of curvature in the plane of the filament, at which place the filament image will occur inverted.

The filament is thus imaged on itself with two effects: (1) the image can be shifted slightly so that the coil images fall between the coils, thus presenting a more uniform source to the rest of the system, and (2) by absorption the temperature of the filament is raised, making it brighter. This two-fold gain is possible only with sources possessing no dark region at the back as do arcs.

Light-Governing Factors

There are just three factors fixing the illumination on the screen and a change in illumination is possible only through these factors. An increase in any of the three factors—(1) the brightness of the source, (2) the quality and number of surfaces and glass transparency reflected in the factor of

DURING the many years that we have been privileged to supply fine projection lenses, we have never experienced a greater degree of cooperation than that afforded us by projectionists. We welcome this opportunity to extend Holiday Greetings to you craftsmen whose knowledge of and appreciation for the exacting demands of the projection process have earned world-wide acceptance for the best that optical design and practical application have to offer.

We are confident that this happy relationship between the maker and users of a precision product will contribute substantially to the future growth and economic security of our great industry.

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reflection and absorption, and (3) the slope angle of the extreme marginal rays to the axial point, or, in more familiar language, the *f* number at the

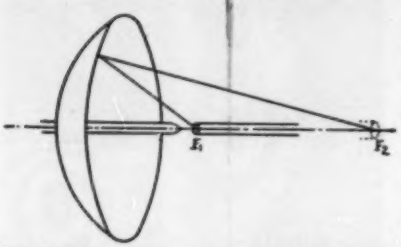

FIG. 10. Perspective representation of an arc reflector. The magnified image of the arc crater at "F_1 focuses at the conjugate focus "F_2".

point—will mean an increase in illumination. But there are natural limits set on all three.

The brightness of sources is fixed by the materials available and does not seem likely to be increased by large factors over current practice so long as we are dependent upon incandescent surfaces, either of tungsten in the familiar lamp or of carbon and gas in the carbon arc. Of course, it is entirely possible that radically new sources will be developed eventually. The carbon manufacturers are working vigorously to provide greater brightness.

Radiant Heat a Vital Factor

However, the greatest handicap to further progress in increasing the arc source brightness seems to be not so much in the carbon itself as in the concomitant heat transmitted to the image. The limiting factor seems to be the absorption of the film, so that visible energy alone (no infra red) in concentrations at present possible and achieved experimentally is damaging to film.

The second factor of reflection and absorption is a serious limitation to the illumination possible through a system. Each air-glass surface reflects approximately 4% of incident light (and even if filmed about 1%) which is lost to the direct beam as useful light. The demands made upon projection systems compel the addition of more surfaces, thus increasing the loss from this factor. Widespread use of coated optics, particularly in projection objectives, has tended to alleviate this factor.

Obstacles to Advancement

The absolute maximum *f* number possible in air is 0.5, for then the marginal rays make an angle of 90° with the axis. We are not likely to see such a ridiculous case, but serious and weighty obstacles lie athwart the path to any substantial increase in the speed of projection systems.

In the first place, because of the high quality of imagery required of projection lenses, the designers are only an insecure step ahead of demand even at present speeds. An increase in speed also means new condensing systems, very likely much more complex. Secondly, greater speeds would mean a redesign mechanically of much of the present projection equipment.

Any substantial increase in speed of present projection systems would present some of the aspects of a revolution and would further aggravate the problem of heat in the film gate.

[THE END]

Hilux Variable Anamorphic

The new Hilux variable anamorphic lens, manufactured by Projection Optics Co., Rochester, N. Y., is now ready for immediate delivery on a "substantial basis." This variable lens unit has a complete anamorphic magnification spread ranging from the old standard Academy ratio up to the full CinemaScope ratio.

Recently completed tests prove that quality of image, chromatic and linear correction, and light transmission are of a high order. The list price per pair of these lenses is $750, with Raytone Screen Co., Brooklyn, N. Y., acting as the primary distributor.

Eidophor Demonstration Planned

A demonstration of the Eidophor Theatre Tv system will be held within the next few months, it was announced recently by 20th Century-Fox. Eidophor is a theatre Tv system developed in Switzerland, which is believed capable of providing a picture much larger and brighter than is now possible. It also shows pictures in color.

Court OK's City Theatre Tax

The Alabama Supreme Court has upheld the constitutionality of municipal theatre taxes. The tax had been challenged by Bessemer Theatres, of Bessemer.

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In The **SPOTLIGHT**

John Shuff (left) presents John Baker with gold life membership card in Local 735, Mt. Clemens, Mich.

This department expresses its gratitude for the gracious cooperation of all those Alliance members who through the past year have given so generously of their time and effort to keep their fellow members informed of the progress of the craft on all fronts, socially and economically. For you, for all of us —

a very Happy Holiday Season

• John Baker, member of Local 735, Mt. Clemens, Mich., was awarded a gold life membership card at the Local's recent 15th anniversary dinner. Baker, now 71 years old, is the oldest active member in the Local. For the past 42 years he has worked in various theatres in Marine City (Local 735 jurisdiction), and at present he is employed in the projection room of the Mariner Theatre there.

Among the out-of-town guests present at the affair were John A. Shuff, IA vice-president and member of Local 388, Akron, Ohio; Frank Kinsora, business representative, Detroit Local 199; Jack Cassin, business representative, Port Huron Local 622; Earl Ross, business representative, Pontiac Local 620, and E. Clyde Adler, business representative, Detroit Local 38.

• Jacob S. Winick, newly elected president of the 25-30 Club, and Harry Garfman, Brooklyn and Queens business representative for New York Local 306, were presented with gold life membership cards in the Movie Social Club of Brooklyn, which is comprised of members of Local 306. The awards were made in recognition of their continuing and unselfish efforts in helping the Club bring a little happiness into the lives of unfortunate shut-ins in various Brooklyn hospitals by providing them with free movies and other forms of entertainment.

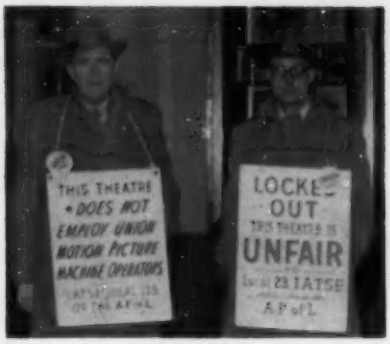
• Sam Pinanski, for many years a partner in M & P Theatres, headquartering in Boston, was honored recently at a surprise luncheon gathering of more than 100 New England film men at the Hotel Statler in Boston. During his tenure of office with the M & P Theatres, Mr. Pinanski displayed many courtesies to members of the organized projectionist and stagehand crafts, and many old-timers in the crafts remember him as a good and valued friend. Now president of American Theatres Corp., Mr. Pinanski has won national recognition for his many valued services to the industry at large.

• Richard (Dick) Nolan, star halfback of the N. Y. Giants professional football team, has a rather intimate relationship with the projection field by reason of his father, Jack Nolan, being a field sales engineer for National Carbon Co. Junior Nolan, now only 22, who has starred with the Giants throughout the 1954 season in the tough pro ranks, has an interesting background.

He attended White Plains (N. Y.) High School, where his football exploits earned him Westchester County's most valuable player award; this in addition to starring in basketball and track, on the latter team running the 100- and 220-yard hurdles. Subsequently he attended the University of Maryland, where he starred on the powerhouse collegiate football squads.

• In protest against a cut in theatre personnel and in salaries, Locals 23 (Stagehands) and 223 (Projectionists), Providence, R. I., have joined forces and are picketing the Pawtucket Strand, a "dark" theatre owned by New England Theatres, Inc. The theatre chain demanded that the projectionists take a $23 weekly cut in salary and also wanted to eliminate the maintenance man. Three years of negotiations failed to produce a settlement, and on July 28 last the IA

This happy group is part of the assembly of members, friends, and guests (including several exhibitors) who helped celebrate the recent 25th anniversary of Local 680, Halifax-Dartmouth, N. S. Guest of honor at the celebration was 5th IA Vice President Hugh J. Sedgwick, shown seated front row centre amid the ladies. A banquet and stage entertainment in celebration of the event was held in the ballroom of the Nova Scotian Hotel.

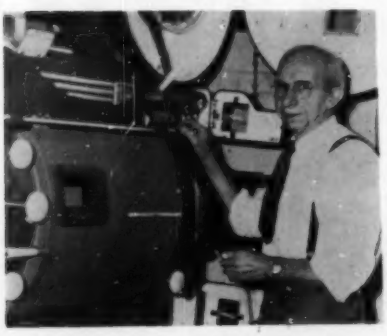


Members of Providence IA Locals picketing the struck Pawtucket Strand Theatre. Charles L. McKenna, Sr., (left), projectionist, and Ralph Fields, stagehand, on picket duty.

Locals notified the theatre management that the house would be struck unless an agreement was reached without further delay. Although the theatre was closed several months ago, supposedly for lack of licensed projectionists, it is being picketed daily by members of both Locals. This particular strike has aroused a great deal of interest, as it is believed to be a "test" case and the basis for settlement with other theatres in the New England area. The Providence Locals are determined to fight the proposed reductions to the bitter end, even if it means indefinite and continuous picketing of the theatre.

• San Francisco Local 162 recently honored its retiring president, Norman E. Moynahan, with a gold life membership card in appreciation of faithful service to the Local for the years since its inception. John A. Forde, International representative for Local 162, made the award on behalf of the Local.

• James J. Brown, member of Local 440, St. John, N. B., Canada, recently completed 43 years working as a projectionist in various theatres in and around Halifax and Moncton. He began his career back in the days of hand-cranked machines when such screen luminaries as Maurice Costello, Florence Turner, Mary Pickford, Francis X. Bushman, and Bronco Billy Anderson dominated the motion picture screens. Brown has spent the last 27 years working in Moncton—22 years at the Imperial Theatre, until it was torn down several years ago to make way for a department store, and for the past five years he has been with the Paramount Theatre, where he is presently employed.



Jim Brown, IA Local 440, St. John, N.B., Canada, a practical projectionist for 43 years.

The modern equipment Brown now works with at the Paramount Theatre is a far cry from the hand-cranked projectors used in the early days of motion pictures. He recalls that in the old days, when 45 feet from projection room to the screen was considered a "long throw," the choice seats were in the gallery (the throw in the Paramount is 125 feet).

In a rather nostalgic vein, Brown also recalls that comedies were the top movie fare in the old days. He remembers when slides were flashed on the screen asking the ladies to remove their hats, and when by faster or slower turning of the hand-cranked machines the playing time of a picture could be either speeded up or stretched —all depending upon the number of patrons in the theatre. He remembers, too, the first "talking pictures" when the talking was done by actors standing behind the screen and who cued their lines to the action seen through the screen. Did we hear anybody say something about the "good old days?" That is precisely what the youngsters of today will be saying years hence.

Norman E. Moynahan (center), retiring president and charter member of San Francisco Local 162, is shown being presented with a gold life membership card by IA Representative John Forde. Seated at the extreme right is Albert B. Cohn, president of the Local.

• We are happy to report that a satisfactory agreement was finally reached between Local 332, Clinton, Iowa, and Central Theatres Corp. A new four-year contract providing for a 5% increase was signed, and the strike vote taken by the Local was recalled. IA Representative LeRoy Upton assisted the union officials in the negotiations.

Greetings and Best Wishes

THE NEW YORK STATE ASSOCIATION

of

MOTION PICTURE PROJECTIONISTS

"An Educational and Technical Society"

Greetings and Best Wishes

to my brother craftsmen throughout the Alliance

MERLE H. CHAMBERLIN

Chief Projectionist, M-G-M Studios

Culver City, California

II. THE LIVING PICTURE. The concluding article of two in which are detailed the development of the motion picture from its inception down to the present. Originally appearing in "Movie Makers" magazine, these articles attracted widesprad industry interest and acclaim.

By JACK E. GIECK

From Toy to a Great Industry

FOR action lasting more than a few seconds some means of continuously replacing the pictures had to be found. One solution was a camera invented in 1876 by Wordsworth Donisthorpe in London. His machine, shown schematically in Fig. 5, consisted of a deck of glass plates coated with a new dry gelatin emulsion which was much faster than the wet collodian or albumen in use at that time. After each plate was exposed, it dropped onto the stack below, permitting the next one to move into place. The camera took pictures at 8 frames per second (Fig. 5).

With this apparatus, Donisthorpe not only took conventional movies, but he also made the first time-lapse studies of such subjects as growing grass, opening buds and frog metamorphosis. To view his work, however, he had to resort to the Zoetrope.

First Flexible Transparent Film

To make motion pictures practicable, some sort of flexible transparent material was needed to transport the pictures. The invention of celluloid by Rev. Hannibal Goodwin in 1887 provided the ultimate solution. Within two years a commercial movie house, *Le Theatre Optique,* was operating in Paris. Though the pictures were strictly animated cartoons, they were the first movies to tell a story.

The Frenchman who devised the equipment was Emile Reynaud. In 1887 he had patented his "Praxinoscope," a Zoetrope whose pictures were viewed through a set of revolving mirrors in the center of the cylinder instead of through slots in the side. This device eliminated the vertical distortion associated with slot-shutter viewing.

Hand-Drawn Pictures

Several years later he built a projection model which had glass sides bearing hand-drawn transparencies. A beam of light from a magic lantern was bounced off the mirrors through each transparency successively, and the result was picked up and projected through a lens.

Finally, in 1889, he built his "Theatraxinoscope." In this machine, a continuous band of celluloid bearing the transparencies wound in and out of his skeletonized projection Praxinoscope. Interestingly, only the moving figures appeared on the film. All the backgrounds were projected separately by means of a magic lantern slide. Reynaud's programs apparently lasted 10 or 15 minutes.

First Film Strips

The first photographic experiments using the new strip film were also performed in Paris by a Dr. Jules-Etienne Marey, who corresponded with Eadweard Muybridge in America. Like Muybridge, he was primarily interested in the analysis of animal movement. In his letters, he complained that strips of film longer than four meters were unobtainable—and

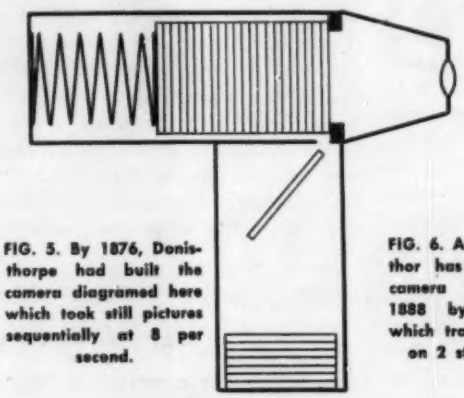


FIG. 5. By 1876, Donisthorpe had built the camera diagramed here which took still pictures sequentially at 8 per second.

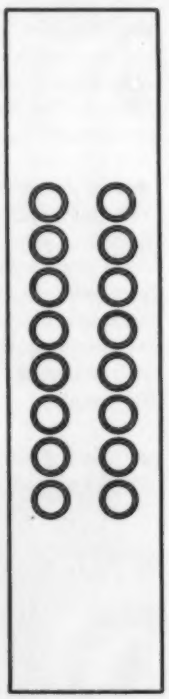
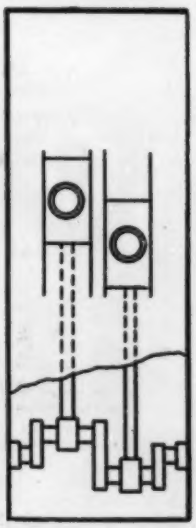


FIG. 6. At right the author has diagramed a camera designed in 1888 by L. LePrince which trained 16 lenses on 2 strips of film.



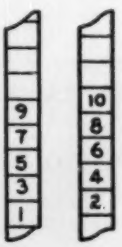


FIG. 7. Owen Eames adapted LePrince's idea to his Animoscope, which involved mounting two moving lenses on crank-shaft.

with his prodigious frame size (3½ square inches) he got only 40 frames per film.

Many ingenious and complex gadgets to handle the new flexible film made their appearance, one of them, a camera invented by Louis LePrince in 1888, employed 16 lenses which were arranged as shown in Fig. 6.

This camera used two film strips, behind each bank of lenses. When the camera was operated, the left bank of lenses would function first, each shutter (beginning at the top) being tripped successively to make a single exposure on the stationary film behind it. When all the shutters on the left bank had been fired, the right bank would begin to operate; and while the right film was being exposed, the left film would be pulled down 8 frames and the left shutters recocked.

Owen Eames' "Animascope"

A variation of this same theme was Owen Eames' "Animascope" (Fig. 7) in which both films moved *continuously* and only two lenses were used. These lenses moved on vertical slides and were actuated by a crankshaft, so that each lens was moving downward with the film while its shutter was open. The frame sequence alternated between the two films as shown.

It will be noted that both of these machines were actually stereo cameras, but no attempt was made during viewing to separate the left and right eye images. As a result, foreground objects vibrated on the screen as the viewpoint shifted back and forth.

FIG. 8. Early Kinetograph strip-film cameras designed by Thomas Edison, as well as several Pathe and Olikos models, are seen in this collection at the Henry Ford Museum.

The next highlights in motion picture history are Edison's development of perforated film; Lumiere's design of the Cinematographe, the first projector to employ a practical intermittent movement, and the advent in 1898 of synchronized sound-on-disc.

All of the early ribbon-film cameras suffered from the same complaint: poor film registry—that is getting the film to move exactly the same amount

Season's Greetings

We welcome this opportunity to extend Holiday Greetings to our many friends in the projection craft who, working together with us through the years, have enabled us to install and operate at peak efficiency the finest projection equipment in the world. Our congratulations to you craftsmen who have made our joint endeavor a very happy association throughout the many years.

Fine Equipment, Prompt Service on a National-Wide Basis

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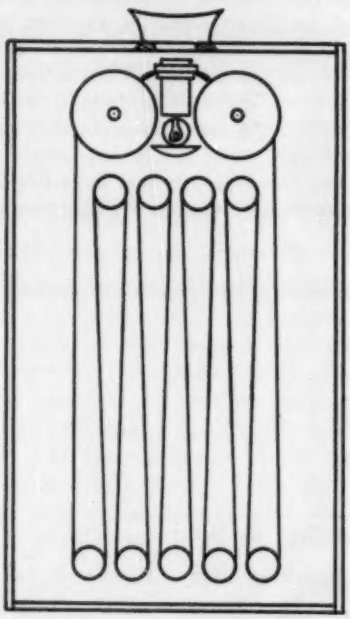
FIGS. 9-10. Edison Kinetoscope, a peep show machine activated by a coin, brought movies to the people. Film path is plotted below.



vertically between frames without any lateral shift. It was Thomas A. Edison who provided the solution to this problem with his invention of perforated film.

1893—Edison's Kinetoscope

Edison had begun experimenting with movies during the 1880's. His first camera was built much like a Zoetrope. It took pictures in a *spiral* on the inside of a cylindrical drum lined with film. A number of his later "Kinetograph" strip-film cameras (as well as several early Pathe and Olikos models) may be seen in Fig. 8.

It was Edison's viewing apparatus which made the motion picture a commercial success *in America*. One of the original models of his "Kinetoscope," patented in 1893, is shown in Fig. 9. A coin-operated, peep show machine, it employed a continuous film which was viewed directly by the observer (see Fig. 10). The frames were printed side-by-side on the film, which sped by at the rate of 46 frames per second.

The quality of the image was not good, since the film moved continuously while the observer watched it through a revolving shutter, and a certain amount of blurring was inevitable. But the public loved it anyway, and penny arcades made lots of money until projection techniques were perfected.

[TO BE CONTINUED]

Color Tv Now Available In 65 Major Cities

Color television can now be transmitted to 65 cities across the nation. Already 145 Tv stations in these cities are receiving network television service and 95 of them are receiving it in color, as well as in black-and-white. Most principal Tv routes are now equipped for color and will be able to transmit color programs to about 95 cities by the end of the year, A. T. & T. Co. announced recently.

Of the 187 stations presently located in these cities and receiving network service, a total of about 125 are expected to be ready to broadcast in color by late December. The announcement pointed out that about 31,000 of the 59,000 channel miles of Tv facilities now in service had been re-engineered and re-equipped to carry color.

Color Compatibility Vital

Bell System facilities had been used for experimental color transmission for several years, but it was not until the approval of the compatible system by the F.C.C. on December 17, 1953, that color Tv got underway on a regular basis. Use of the compatible system makes it possible for owners of conventional black-and-white Tv sets to receive color broadcasts in black-and-white. Owners of color sets can receive both black-and-white, and color programs as broadcast.

On January 1, 1954, the first public colorcast was carried from coast-to-coast when the Tournament of Roses Parade in Pasadena, California, was fed to stations in 18 cities in the U. S. By May 1, the first coaxial cable route, between Dallas and Houston, Texas, had been readied to carry color. Long Lines also noted that 1954 marks the 25th anniversary of the first public demonstration of color Tv. On June 27, 1929, a group of newspaper reporters gathered at Bell in New York to see a colorcast of an American flag rippling in the breeze.

RCA Employes Honored

Radio Corp. of America has announced that 265 employes of its product manufacturing and service division, who in 1954 completed a quarter century of service, have been inducted into the RCA Victor 25-year club. Nearly 1,800 men and women have become eligible since the group was formed in 1948. The new members were presented with gold watches in a series of banquets.

Season's Greetings

CLAYTON PRODUCTS CO.

New York 63, N. Y.

Season's Greetings

LOCAL NO. 162
I.A.T.S.E. and M.P.M.O:
San Francisco, Calif.

Greetings and Best Wishes

PROJECTIONISTS LOCAL NO. 407
I. A. T. S. E. and M. P. M. O:
San Antonio, Texas

Industry Interdependence Cited

By PAT McGEE

Keynote Speaker, TOA-TESMA-TEDA-IPA Convention

The interdependence of every branch of the motion picture industry was never more forcibly demonstrated than at the recent joint industry conclave in Chicago where exhibitors, the employers, and projectionists, the employees, met frequently in informal gab-fests to discuss not projection exclusively but industry problems overall. As in other major industries where clear thinking and foresight prevail, the day has long since passed when the common interest is subordinated to short-sighted self-interest—which has only a brief life span.

For this reason, IP believes that the appended excerpts from the convention keynote address by Pat McGee is of extreme interest in that it points up the fact that financial security for both exhibitor and projectionist is dependent upon a mutual understanding of and the desire to solve common industry problems.

THIS convention will deal with our most pressing problems. Consider, first, the effort to have the Federal Communications Commission approve a type of home box-office Tv, a project which presents many immediate dangers. Another problem of great importance is to maintain the gains won through the reduction of the Federal excise tax, which is threatened in many states and cities by the imposition of local taxes.

Just think where you would be today if you still were paying the full 20% excise tax, instead of which more than 8000 theatres in the country are paying no tax at all!

Overshadowing all problems is the very basic need for our theatres to have sufficient pictures to provide the change of diet necessary for our patrons, and the necessary prints to make this possible. Unless we have good pictures at reasonable terms and in ample supply, *we need not concern ourselves with any other problems!*

Industry Leadership Lacking

One of the by-products of the tax campaign's research and probing was the startling realization that nowhere in this industry could you find leadership or statesmanship in the *true* sense of the word. Instead of statesmanship, we found in all branches of the industry people working for their own interests to the *exclusion of all other interests.*

Because the producers and distributors are few in number and deal in millions, we have expected them to be looking out for the interests of the industry rather than confining themselves *exclusively* to their own interests. In short, we expected them to exercise enlightened self-interest. I am sorry to say that this is lacking in a major degree.

What must claim our immediate attention is the fact that we are not out of the woods as an industry. From 1946 to the present, we have had a steady decline in attendance in our theatres. This decline has never been checked and continues today. In the face of increased results in major cities, 80% of the theatres today are showing 7% less attendance than we had last year! and the dollar volume, including $123,000,000 provided by tax relief, has not increased materially.

In our own circuit, attendance is 7½% below a year ago, while our dollar volume has increased 6%, which should have been a 12½% increase, based on the fact that we have a net savings of 12½% on the excise tax. With increased film rentals of 5 to 10%, you can see what happens to the profits.

Even in the days when we boasted of selling 80 to 90 million tickets a week, we never had that many individual theatregoers. We had about 45 million frequent attenders. People did go two and three times weekly; but with the declining number of pictures there is also a proportionate decline in the *opportunity* to attend, which is one explanation for lowered attendance in total.

Moviegoing Habit Broken

Of course, Tv has accounted for some of this, too, but between both factors

★ ★ ★

Season's Greetings

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

NEW YORK

★ ★ ★

the public *got out of the habit* of going to the movies, a habit on which was founded a major part of the industry's success.

Our job will not be done by relying on a few big pictures at increased admission prices!

In a few big cities the fine new pictures at greatly increased admission prices show vastly improved grosses, but these results have not reached, and are not likely to reach, 80% of the theatres in the nation. There has always been, on the part of production and distribution, an inclination to repeat what the other guy has said—thus, you hear the cry that fewer but better pictures are the answer to the industry; while we exhibitors, with our fingers closer to the facts, say that such a policy will eventually kill us!

We say, always try for better pictures, *but more of them*, to keep up interest in the thousands of theatres in smaller communities of the country which cannot live in a market of short supply.

Playing Time, Print Shortage

I now mention extended playing time and print shortages. As the number of pictures available decreases, those theatres in the key cities find their film terms and the length of runs increasing, and their admission prices increasing. The too-high film rental reduces or eliminates your profit to start with.

The too-long run causes you to reach the point where the declining gross brings you to the break-even point, and the lack of a picture to follow compels even further extending the run, and this throws you into a loss.

In the neighborhood, or sub-run field, the high terms have reduced the profit, and the long run downtown has milked your potential, so that between the two factors this group, too, shows a loss. Fewer features mean fewer pictures clearing to the sub-runs, which cannot extend playtime to offset the lack of product, since their customers have already bought tickets downtown.

The same thing exists in the smaller towns. Theatres which changed three and four times a week now change twice a week, or play weekends only. If they change oftener, they are picking up old pictures which have played many times already, merely to fill out the playtime and with no hope of profit.

Estimate of Possible Closings

These problems could be cured quickly with a larger supply of good pictures. Producers say that this is impossible. If it really is impossible, then we must face the fact that from 5- to 8000 theatres in this country must close! Friends of mine in distribution have actually said that they are *reconciled* to the loss of 5000 additional theatres.

This is a heart-breaking thing to

Short Subject V-V Prints!

Projectionists should be on the alert for the forthcoming VistaVision shorts which are now in production by Paramount. Proper identification of prints is the first requisite for a satisfactory screen image. A V-V short subjects production program that will yield from six to eight pictures a year at the outset has been announced by Par.

The one- and two-reel subjects in the new production and screen presentation process will be in addition to the regular one-reel Technicolor cartoons and black-and-white subjects the company has been turning out in 1.66 to 1 aspect ratio. During the 1954-55 short subjects year, which began Oct. 1, Par. will release 60 such one-reelers.

Par's first short in V-V, titled "Vista-Vision Visits Norway," currently is being readied for general release, thus enabling theatres booking "White Christmas" to present their first V-V, perfectly-balanced program. Both are in Technicolor as well as V-V.

Greetings . . .

We at Century Projector Corporation are happy and proud to extend Holiday Greetings to the projectionist craft which has contributed so much to the progress of the motion picture industry.

As the designers and manufacturers of the first professional horizontal-type projector, we know that the fine spirit and technical know-how displayed by the projectionists at the Radio City Music Hall in New York City on the occasion of the first showing before a critical audience of VistaVision's "White Christmas" is reflected in the painstaking efforts of the craft throughout the world.

This community of technological interest and effort can only redound to the greater success of our industry.

—Many Thanks

Century

CENTURY PROJECTOR CORPORATION

729 Seventh Avenue New York, N. Y.

those exhibitors numbered among the 5000. The disparagement of the small-town and the neighborhood theatres shocks me, perhaps, most of all. The dollars-and-cents value of these theatres may not be great. The social value of these theatres and their value as developers of "feeder-business" is beyond estimate.

Wise sales analysts have demonstrated that while a smash picture can recover its investment in the larger situations, the widest possible playing time is needed to rescue the run-of-the-mill picture and the nervous "A" pictures from the loss columns. We say that if a third of the theatres close, the industry, as constituted today, cannot survive. Also' it would inevitably lead to still fewer and more expensive pictures, and it is hard to say where this would end.

Admission Price Level

There is no doubt that the declining attendance is coupled with ever increasing admission prices. There is danger that we are over-pricing ourselves at the box-office. Remember the book publishers who were in the doldrums. As an experiment, a number of stories were issued in a 25-cent, paper-back edition, which caught on like wildfire, rejuvenating the entire business. There is a lesson here for us.

Distributors have watched the key center grosses and have assumed that they can get 40% and 50% film rentals without question, when we know that 80% of the theatres, by paying such terms have reduced their profit margins to the point where they cannot maintain their properties.

Giant Research Program Urged

Instead of guessing at things, the whole industry should join in a giant engineering research and analysis, under neutral direction, such as COMPO. Our entire machinery is outmoded and archaic. There is an appalling amount of waste in distribution and some remains in production, although many economies have been effected in the studios. Where there is waste, no matter where found, it ought to be eliminated. Industries, such as oil and steel have found ways to streamline their distribution methods, and ours cries for surgery.

Let's boil all of this into a few words. Producers and distributors have failed to exercise "enlightened self-interest" in dealing with exhibitors. Their belief in fewer but better pictures is being followed blindly without regard to the end of the road several years hence. Their policy of fewer but better pictures, coupled with unreasonable terms, has deprived the American theatre of its rightful share of the boxoffice returns and of the tax saving which we provided. The pendulum has swung too far in favor of the seller. The market must be brought into balance through economies which will enable the distributor to allow easier film terms; and the market must be brought into balance by providing additional pictures from whatever sources are available in order to revive competition on a healthy basis.

Progress Requirements

We can go about this by following a planned program of:

(1) Encourage present producers to make additional pictures as good as they know how.

(2) Encourage foreign producers to analyze our needs in the United States and make pictures that will interest American audiences. This can be done by using American stars in foreign productions coupled with foreign personalities. Mr. J. Arthur Rank wants a larger share of the American market. Our screens are open to him but he must find a way of appealing to the American theatregoer who so far has shown little interest in most English pictures.

(3) We must have a distribution channel more sympathetic to our needs for product during April and May, November and December, when we really must tighten our belts for lack of film.

New B. & L. C'Scope Lenses

Bausch & Lomb's new CinemaScope camera lenses have been delivered to five studios as well as to 20th-Fox. Other studios are Warners, M-G-M, Columbia, RKO Radio and Walt Disney Prods. Deliveries to additional studios are to be made soon.

While the full Bausch & Lomb series of CinemaScope taking lenses will total seven, ranging from 13 to 152 mm in focal length, thus far only the 35, 40 and 50 mm lenses have been delivered. Anxiously awaited is the 13 mm lens, capable of covering a 122° horizontal field angle, seen able to dwarf anything presently available to photograph films for 35 mm projection. The lens series eventually will cover from 122° to 18°.

City Theatre Tax Repealed

The city of Springfield, Ohio, has repealed its three percent admissions tax, effective January 1 next. It is the largest city in Ohio to do so in many years.

Greetings

As power supply-specialists we pride ourselves on having provided for many years the most dependable equipment for projector arc current. For all types of operation, and for all current ranges, we have supplied the craft with both rectifiers and motor generators to meet your every requirement.

With great pleasure, therefore, we at this time acknowledge our indebtedness to the projectionist craft and extend our thanks and heartfelt best wishes for a Happy Holiday Season.

J. E. ROBIN, INC. MARK OF QUALITY

J. E. ROBIN, INC.

267 Rhode Island Avenue, East Orange, N. J.

Century Projector Corp.'s Fabulous Feat in Producing Horizontal-Type Projector

ONE of the most glowing tributes to the ingenuity and resourcefulness of the technical group within the industry—which today is acutely technologically-conscious—was the achievement by Century Projector Corp. in designing and producing within a whisper of time the double-frame, horizontal-type projector which was used at the world premier of the VistaVision print of Paramount's "White Christmas" at Radio City Music Hall in New York City, shown on a giant-sized screen.

This projector was described in detail in the October last issue of IP.

The accompanying line illustration offers graphical evidence of the all too brief period in which was translated an idea into a mechanical reality—but this in no wise conveys the near-heartbreak, the bated breaths and the back-breaking feverish activity which was poured into the production within an incredibly short span of time this revolutionary projector mechanism.

Near-Incredible Time Schedule

A blow-by-blow, transcontinental phone-calling, drafting-board and machine-working schedule (omitting the near-hearthbreak attendant upon a full crew of technicians which was "ready to go" only minutes before the scheduled opening time) would run something like this, according to Larry Davee, engineer and sales manager for Century:

Sept. 22. Regular review of experimental work by Paramount studios in Hollywood and decision to "go ahead."

Sept. 23. Phone call from Hollywood to New York during which Century accepted order to design and produce the radical new projector intended to show film that runs horizontally through the mechanism, with each frame eight sprocket holes in width.

Sept. 24. Development begun at the Century plant in Long Island City. Problems included designing a heavier intermittent movement to absorb the shock of an eight-sprocket hole pull-down *(or, rightly, pull-to-the-side)*; design of extra sprockets to redirect path of the film from the *horizontal* path in the head to the *vertical* position of the magazines; and reversing the film path in the projector because the camera and printing processes for the special prints could only produce them in reverse.

Oct. 6. First mechanism inspected

Charlie Muller, director of projection at the world-famous Radio City Music Hall in N. Y. City

by Charlie Muller, chief projectionist at Radio City Music Hall, in the Century factory.

Heads Delivered to Music Hall

Oct. 8. Two mechanisms delivered to the Music Hall.

Oct. 13. Screen at the Music Hall was available for one hour for lining-up projectors and other tests.

Oct. 14. Preview for press, followed by continuous public showings thereafter.

Mr. Davee estimates that the first horizontal projector, which was completed in 12 days would ordinarily have taken from four to six months

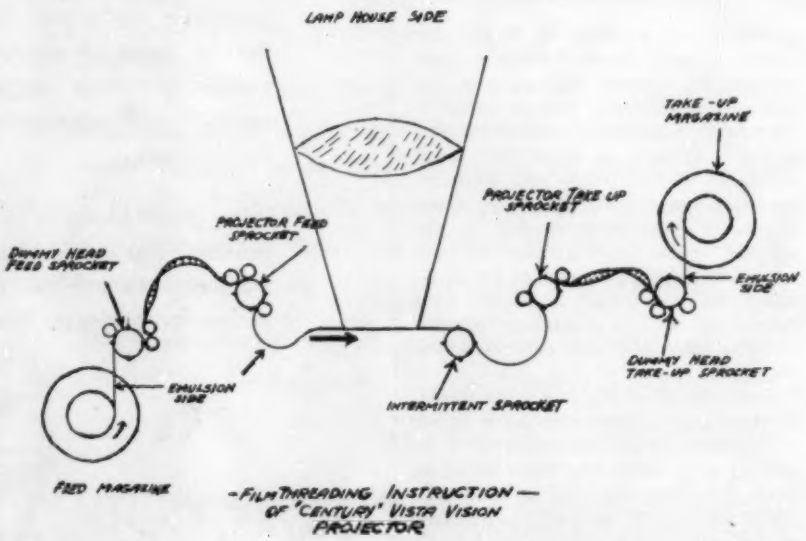
S	M	T	W	T	F	S
		Sept.	(22)	(23)	(24)	25
26	27	28	29	30	Oct. 1	2
3	4	5	(6)	7	(8)	9
10	11	12	(13)	(14)	15	

Graphical representation of extremely tight time schedule for conception, design and production of the Century-VistaVision, horizontal-type projector used for world-premier showing of "White Christmas" at Radio City Music Hall in New York City. Significant dates, as explained in accompanying article, are encircled.

to design and produce. Century is now in the process of building standard production models of the horizontal projector, which will be ready for delivery in January next, and will have optical soundheads. The first models did not have sound pick-up but were synchronized in the projection room with a separate soundtrack run through another standard 35-mm projector.

Not discounting in the least the travail of the Century factory technicians, Mr. Davee is on record as stating that "without the magnificent cooperation of Charlie Muller, director of projection at the Music Hall, and his swell gang of craftsmen in both the projection room and on stage, this accomplishment would have been impossible."

Take a bow, Charlie, and gang. IP is proud to have you aboard.



Rough sketch which provided the film-threading guide for the use by the projection crew of Radio City Music Hall of the horizontal-type projector as used for the first time. This drawing does not necessarily represent the ultimate form of this new and novel film-threading procedure.

Projectionist Problems as Seen From the Viewpoint of the Lens Maker

SOME projectionist problems arise from the different languages spoken by projectionists and the lens people. For instance, "This lens gives a flat picture." To the lens designer "flatness" means that the image is projected to a flat surface with very little loss in definition from the center to the edges. To the motion picture trade people, it usually means that the illumination is uniform across the screen.

The biggest problem is caused, however, by the fact that lenses are carefully designed for certain standard conditions of operation, but that in actual practice these conditions are often not met. Few people would want to take a 1954 automobile engine and put it in a chassis built in the 1920's. What is built in 1954 should be used and associated with equipment modernized to take full advantage of recent developments.

The results of the toil and effort of countless individuals are recorded on an area not much larger than the size of a 25c coin, and this area has to be magnified many thousand times by a lens so that millions of people may appreciate and enjoy these records. Good lenses are made to be equal to that task and they should be treated as one of the most important components of the projection technique.

Vital Projection Requisites

Getting into the technical aspects of conditions for good projection, we must list the following:

1. The lens must be held rigidly and be properly centered and squared to the aperture.

2. The front of the lens and associated apparatus should be large enough so as not to interfere with the light passing through the lens.

3. The film, aperture plate and other equipment near it must be properly cooled and designed so as to eliminate flutter and excessive buckling of the film.

Enlarging upon these points, it happens quite often that a good lens is blamed for uneven focus when the holding mechanism is obsolete and at fault. Sometimes the clamp is too loose and the lens shifts during operation; sometimes the clamp is too tight and introduces strain in the lens; and sometimes the lens holder has been thrown out of alignment and the lens is therefore cocked in the projector. For good projection, the carbons, center of the aperture and the lens axis should be lined up as carefully as possible, especially with modern high-speed lenses.

Factor 2 aforementioned was not much of a problem until recently when the use of short focal length lenses was greatly increased. Because of the short focal length, the lens is located close to the film, and the distance from the front surface of the lens to the face of the projector may be as much as 5 or 6 inches.

For the purpose of reaching the lens, shade tubes are added to the

★ ★ ★

Holiday Greetings

and

Best Wishes for 1955 to All Our Friends

★ ★ ★

THE BODDE SCREEN COMPANY

8829 VENICE BOULEVARD LOS ANGELES 34, CALIF.

front of the lens to extend in front of the projector. Manufacturers constantly remind the trade that shade tubes should be used only with care with short focal lenses. Many installations are destroying their picture quality by misusing these tubes. The light beam is cut, and instead of getting the amount of illumination at the edges that passes through the lens, this illumination is reduced to a very low value by the front of the projector or by shade tube interference.

Most of the projector heads manufactured since the war extend quite far in front of the film, and cause a problem with the use of short focal length lenses. To remedy the situation, a projector can either be modified to give a larger opening such as the modification for use of 4-inch diameter lenses, or by using lenses designed to pipe the light through the small opening of the projector head.

Modern lenses, which mean high speed and also mostly short focal length, are designed to transmit a tremendous amount of light. As everybody knows, a lot of light means a lot of heat. With heat we encounter problems of expansion and distortion which are all concentrated near the aperture, but as many carefully planned installations have proved, this problem can be overcome *not* in the lens but in the provision for proper cooling of the projector.

Expediency and false economies can also do a great deal to reduce the efficiency of properly designed projection equipment. Lenses are designed for a specific purpose and, in particular, a definite focal length. For an amateur where quality of projection might be secondary to convenience, elastic magnifications might be advantageous. Professional projection requires a good quality ahead of convenience, and lenses can be made to do various tricks only at the expense of the end results.

Mobile Cinerama Equipment

Mobile equipment, capable of handling showings of "This is Cinerama," in smaller theatres was demonstrated recently on the West Coast by the National Theatres chain, which plans to use the equipment. A basic feature is a system of mirrors which makes it possible to use only one projection room instead of the three heretofore required in Cinerama installations.

Selenium 'Selectifier' with Fine-Control Features

Modern projection requisites have dictated the final form of the "Selectifier" line of selenium rectifiers in order to provide easier regulation and overall better adaptation to the high-power arc-lamps needed for wide-screen projection. Selectifier ranges for all indoor and drive-in requirements include ratings, in amperes, of 50-70; 70-90; 90-115; 150-200; 200-250, and 260-300—all these being for 3-phase power supply.

Where only single-phase current is available, there is a Selectifier model to which have been added choke filters to produce the best possible supply under the circumstances.

Salient Design Features

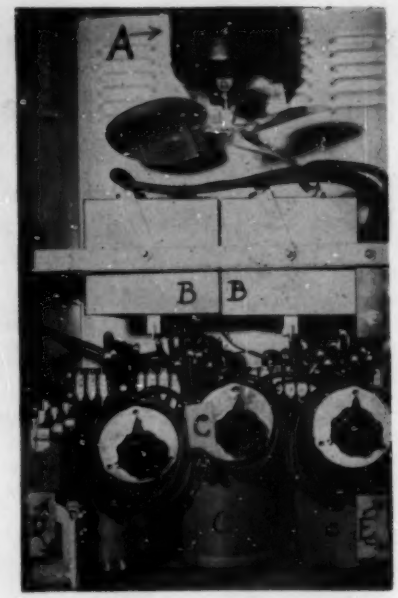
The various Selectifier units, in whatever range, were so designed as to provide maximum and minimum amps-and-voltage supply for each specific application. That is, once the rectifier is installed, the amp-voltage output to the arc may be adjusted to the proper level for continuous, trouble-free operation. By adjustment of each of the three primary rotating switch contacts, and by raising each switch one tap at a time, it is possible to increase the output current by approximately 1 volt and 2 amps *per step*. This is fine-control protection.

Among the noteworthy features of Selectifiers are:

1. Downdraft ventilation with clean air intake high on the sides of the cabinet. A 14-inch, 1/6-h.p. fan ("A" in photo), with ¼-h.p. frame, permanently lubricated, to force the cool air down over the 50,000-hour selenium stacks ("B" in photo), and the oversized transformer coils, dissipating any possible excess warmth over the floor instead of picking up dust-laden air from the floor and blowing it onto the equipment.

2. Stacks may be relied upon as long as a motor generator, without brush or commutator troubles.

3. Transformers large enough for continuous operation, with all glass-insulated, heavy square magnet-wire-wound coils, big enough to carry the second arc, too, in an emergency.



Norpat's "Selectifier" selenium rectifier, lettered designations of which are explained in the accompanying story.

Trouble-Free Operation

4. Heavy oversized, 110 volt-actuated, magnetic 3-pole contactors instead of a small relay, to prevent contact troubles and replacements.

5. Independent rotator switches on each phase to select exactly the voltage and current required, even when the evening's Tv and marquee loads come on and drop the line voltage.

6. A means for changing the low-voltage A.C. from "low" to "high" voltage ranges in the event arcs are changed.

7. An alarm bell ("E" in photo), controlled by a thermostatic switch, to warn the projectionist of overheating, so he can use a floor fan temporarily, in the event all other built-in precautions are not enough.

Complete details from Norpart Sales, 113 West 42 Street, New York 36, N. Y.

Greetings and Best Wishes

MOTION PICTURE PROJECTIONISTS
LOCAL NO. 303, I. A. T. S. E.
HAMILTON, ONT., CANADA

H. H. THORNBERRY
President

H. W. USHER
Business Manager

To Err Is Human

To the Editor of IP:

In reference to my letter which appeared in the September issue of IP, (page 28) I now believe some of the statements contained in it to be misleading. The statements I refer to were concerned with the CinemaScope picture we obtained here on a 26-foot flat screen. Our problem was caused, I believe, by the six-inch focal length objective lenses we were using at the time in combination with the anamorphics.

One of these lenses was excellent in focus and sharpness. The other lens had been blemished and was giving a hazy and cloudy picture. These lenses were installed temporarily because modern six-inch lenses were unobtainable at the time. The distortion I mentioned in the letter, which caused straight lines to appear as curves on the screen, was due to defects in the early wide-screen pictures, I am now told.

I also spoke of keystone distortion, but at this theatre we actually have a very low angle of projection, not exactly screen center, but not enough to cause any noticeable distortion. I was too hasty in my previous letter and certainly should have stopped to think before jumping to conclusions. Our service engineer here is a man of very high standards and long experience. I should have consulted him further before stating facts which were exaggerated. Now that new six-inch lenses have been mounted on the projectors, we are getting an excellent CinemaScope picture, and have received many favorable comments.

ARNOLD HUMPHREYS
Bathurst, New Brunswick, Canada

EDITOR'S REPLY: It happens every now and then that a number of "blind alleys" must be investigated before the solution of a technical problem finally turns up. Even though we have never personally encountered the particular type of trouble described in Mr. Humphreys' first letter (IP for September 1954, page 28), we are more than glad to have had the opportunity to ponder the problem from a theoretical point of view.

The difficulty described *could* happen in unusual cases of mismatched optics. But the main thing is that the cause of the trouble has been discovered, and that the CinemaScope projection in Mr. Humphreys' theatre is now entirely satisfactory. All's well that ends well. We are also happy to be assured that Mr. Humphreys' service engineer is among the great majority of engineers who, we know by experience, are highly competent and unfailingly helpful.

Proper Lens-Cleaning Procedure

To the Editor of IP:

I have read with great interest the numerous articles IP has published on the proper method of cleaning lenses. We seem to be in agreement on the method of cleaning; but we disagree on the use of water and soap or detergents *vs.* volatile solvents.

Kollmorgen Optical Co. instructions for the cleaning of lenses have been practiced since 1948, and we have had very few, if any, negative comments. We do get lenses in for reconditioning which evidence that powders have been used in the cleaning process, with the result that the lens coating, especially on the outside of the rear element, has practically been removed.

We feel that solvents are more advantageous as a cleaning agent than water, soap and water, or detergents and water, because they dissolve oily residue more readily. Also, solvents evaporate, while water must be dried off.

We try to make our instructions both simple and effective. We specify lens tissue because it was found impossible to accurately describe just what constituted "clean cotton cloth" or "well-washed" linen.

Another problem in recommending soap as a cleaning agent was to specify *exactly* what was meant by "a weak soap solution." In some areas, because of "hard" water, considerably more soap would have to be used than in "soft" water areas. The soap must be removed with distilled water, or layers will form and become baked by the heat of the arclamp. The only possible way to remove such a deposit would be by volatile solvents.

In repairs, we have found that the rear gasket seldom shows any disintegration, regardless of what method of cleaning was employed.

No matter what the method of cleaning, the lens coating, especially on the rear element, will eventually wear off. Kollmorgen has a standard reconditioning job that consists of repolishing and recoating this element; cleaning, adjustment and resealing. Such a job, if it is done every two or three years, will, we believe, maintain the lenses in excellent condition.

J. A. FETHERSTON
Kollmorgen Optical Corp.,
30 Church St., N. Y. City.

I. A. OBITUARIES

WILLIAM J. GUNDLACH, 62, president of Local 106, Marion, Ind., died suddenly on November 21. A member of Mixed Local 106 since 1923, he spent his early years traveling around the country with road shows. In later years he worked as projectionist in local theatres and at the time of his death was employed at the Paramount Theatre in Marion.

FRANK MILLER, member of Local 171, Pittsburgh, Penna., died recently after a lingering illness. He held membership in the Pittsburgh Local for many years and worked as projectionist at the Plaza Theatre until ill health forced him to retire from all activities.

JOHN FEATHERSON, 52, member of Detroit Local 199, succumbed recently to a heart attack. For the past 26 years he worked in the projection room of the Washington Theatre in Royal Oak, and his sudden death came as a shock to his co-workers.

T. C. CLARK, member of Local 547, Sheffield, Ala., for the past 30 years, died in his sleep from a heart attack on November 16. Known locally as "Picto" or "Big Alabama," he was popular in projection circles in and around Sheffield.

EARLE WATERS, 52, member of Local 680, Halifax-Dartmouth, N. S., died suddenly last month. For many years he had been employed at the Garrick Theatre, known in the days of vaudeville as the Strand Theatre.

JAMES C. CHAMBERS, SR., 75, member of Local 143, St. Louis, Mo., died last month after an illness of several years. He was very well known in projection circles in the St. Louis area, having worked in many of the theatres there since he joined the Local back in 1909. His son, James, Jr., is also a member of the Local.

LOUIS J. BOUDREAUX, 58, member of Local 293, New Orleans, La., and projectionist at the Saenger Theatre there since it opened 27 years ago, died suddenly last month. His untimely death was a shock to his many friends in the industry.

Theatre Tv in Germany

German theatre owners in Bavaria are planning a theatre Tv network to provide special news programs via closed circuits to some 300 situations. The owners expressed dissatisfaction with German newsreels. Regular Tv service in Bavaria was started only this Fall.

STUDIO LIGHT HISTORY

(Continued from page 16)

they provided a soft, more or less non-directional source of light, the cinematographer also often tried to use incandescent tungsten bulbs for certain effects. His efforts in this direction were largely frustrated at the time because of the low speed and limited color sensitivity of the film then used. The preponderance of light from the tungsten bulb is in the red end of the spectrum and his film was blind to red.

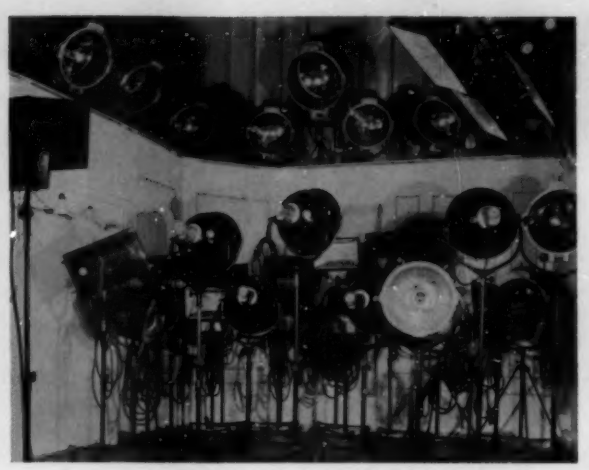


FIG. 4. Grouping of incandescent tungsten lamp equipment of the types more popular in the late 1920's and early 1930's with some still in use.

Panchromatic Film

Color motion pictures were not a major factor in those days, but color rendition in shades of gray of the same saturation as seen by the eye when looking at the original was something the cinematographers needed badly. Even a reasonably light-red object would photograph black. The advent of panchromatic film gave the cinematographer a better control of his gray scale and also made it possible for him to start experimenting with incandescent tungsten bulbs.

In spite of equipment that was ill-adapted and inefficient, the cinematographer was beginning to achieve an art form when the advent of sound in 1927 imprisoned his cameras in static, awkward, soundproofed booths. The importance of the new sound medium transcended all demands for photographic quality and the cinematographer was forced to reduce his art to a mechanical function in order that acceptable sound might be obtained.

Restrictive Lighting

Restricted to small sets and with his camera static, the cinematographer began to experiment with fresh approaches to his goal of photographic dramatic effect. Soon a number of cameras were running on the same set in order to achieve the effect of movement, and the cinematographer began casting about for light sources that would not be restricted, as were his cameras, by the noise they created.

He had been experimenting with panchromatic film which was not blind to the red light, and in the incandescent tungsten bulb he saw a lighting medium with which he could obtain soft effects and which he could use for base lighting.

Some people in studio management saw in the incandescent bulb a means of economic gain whereby set lighting would be accomplished by a push of a button. They put all of their publicity efforts behind an incandescent-bulb campaign and for a time the carbon arc was virtually discarded, with orders in some places that it could be used only by special permission from the management.

False Economy in Production

Fortunately the novelty and value of added sound helped to overcome the photographic deficiencies of the period which followed. Camera lenses were not corrected for the red end of the spectrum and focus problems were legion. Sufficient incandescent-bulb equipment was not immediately available and certain motion pictures took on a dark, soft-focus appearance that was highly touted as the "new look" of the day.

The pressure against the use of the supplementary carbon-arc lamps for sunlight, streak-light and other of the depth- and drama-producing effects

★

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Arc Lamp Specialists for More Than a Quarter Century

was not only unfair to the efforts of the cinematographer, but to the value of the incandescent bulb itself. Partly as a result of this, many pictures were made where scope was limited to the techniques of the legitimate stage.

But as sound was absorbed into the industry, the cinematographer was again recognized as a creative artist. His immediate demands were for a lamp with twice the light and twice the penetrating power of anything available from the existing incandescent tungsten bulbs.

Flexibility the Keynote

A rifled glass reflector, which had been used for incandescent tungsten flood-lighting at a distance from the source, was used as a basis for this demand for twice the light and twice the penetrating power. From a light collecting and distribution standpoint it was particularly well engineered; from a utilization standpoint it was not flexible (Fig. 4). What the cinematographer wanted was a light with twice the intensity, twice the penetrating power and one that could be used at varying distance with control of beam spread and light distribution.

Of course the demand was fantastic! In order to give the cinematographer what he wanted, it would be necessary to sacrifice engineering efficiency all the way along the line. It would mean more powerful incandescent bulbs, bulkier equipment and higher operating costs. What had to be learned was that the efficiency of utilization was the all-important factor and that strictly engineering or tight-drawn economic factors must be made to compromise.

Compromises were made. Ten-kw bulbs were produced and even a 50-kw bulb was tried. The equipment became more flexible. Compromises were also made by the sound departments. Carbon-arc lamps, now filtered with electrolytic capacitors to reduce generator ripple, again appeared on sets where the effects of sunlight, streaklight and back-light would allow the cinematographer to express his individuality and to produce the illusion for which he was striving.

Constructive Outlook

It was this era that marked the first of the major changes made by manufacturers of studio-lighting equipment to provide units with maximum power and maximum utilization. Spe-

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(True speed of f/1.7 in all sizes where fast lenses are needed)

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cialized incandescent bulbs were produced to replace those which had been adapted from other fields. In 1934, lamps with large-diameter, mirror-type optical systems were replaced with stepped-prism condensers made along the lines of the well-known Fresnel lens system (Fig. 5, 6 and 7). It appeared as though the industry was settling down to a lighting technique in which the incandescent bulb and the carbon arc were lighting tools available to the cinematographer depending upon his own interpretation of his artistic needs. The one exception was the clarion cry, "I want a lamp with twice the light and twice the penetrating power."

The first major revolution was in the advent of sound. Now color stepped in for a go at it!

Carbon Arcs to the Fore

Technicolor, who had been struggling with a two-color process, announced that they were ready to launch motion pictures in the full color scale and that the white light of the carbon-arc lamp would be needed for the process. The announcement by Technicolor did not produce chaos in the industry as had the arrival of sound, because the studio people believed that color was something they could take or leave alone.

Technicolor's "Becky Sharp"

The advent of *Becky Sharp*, Technicolor's first major three-color release in 1935, did cause a revolution in the studio-lighting field. The carbon-arc lamp was again to be the predominant studio-light source and

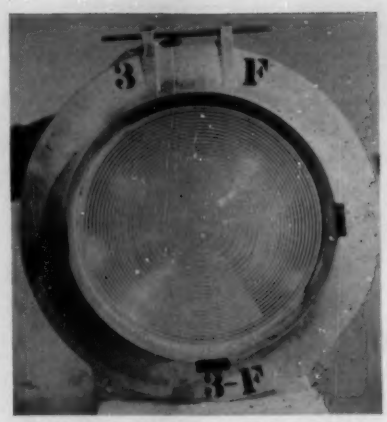

FIG. 5. Stepped-prism, Fresnel-type lens introduced in 1934. Controllable beam spread of from 8 to 48 degrees. Introduced to the industry by Mole-Richardson Co., Hollywood.

the unbalanced spectrum and comparatively low light output from a single unit of the incandescent bulb made its future appear quite bleak to many observers.

The New Arclamps

Some work had been done on the design of a new type of carbon-arc spotlamp and these were hurried into production. For floodlighting, an adaptation of the older carbon-arc floodlamps was made and later a completely new design was manufactured and replaced the earlier units. It was the heyday for the carbon arc. It would be necessary to throw away more than half of the energy from the incandescent lamp to make it match white light, so to all intents and purposes it was through insofar as use on color sets was concerned.

But the cinematographer missed the soft diffusion, the small overall equipment size and the fill-light quality he obtained from the incandescent lamp almost as much as he had missed the small source size and great power from one unit of the carbon arc in the early days of sound; so color filters were made and incandescent lamps found their proper niche in Technicolor photography even though the film sensitivity did not indicate their use as an economic value.

The more restricted latitude [ED. NOTE: *Latitude is leeway in lightening or darkening the film during development, thereby compensating for errors in photography*] and even the handling of color itself, made it necessary to apply greater engineering efficiency to motion-picture photography in order to obtain added dramatic effect which color itself could provide. For the successful introduction of three-color, motion-picture photography, Technicolor found it necessary to demand certain engineering requirements so that the finished product would provide this dramatic effect.

Light Balance Extremely Important

In order to accomplish this result they supplied their own technicians to operate the three-strip cameras and contracted with a number of successful cinematographers to supervise the set lighting. As soon as possible, all cinematographers were made familiar with color requirements, one of which was the accurate control of light. The cinematographer still does much of his light balancing by visual means, but he also reads *(Ed. Note: With an exposure meter.)* the incident light in various areas and when he goes beyond the latitude of the system

FIG. 6. Modern carbon-arc lamp equipment.

FIG. 7. Modern incandescent tungsten lamp equipment.

in order to obtain a certain dramatic effect he has been forewarned.

A Major Technicolor Advance

One of the major advances made by Technicolor was the announcement that they had doubled the photographic speed of the system. When the cinematographer was asked if this would bring about the use of smaller units, the response was that much of it would be used for increased depth of focus and greater latitude of operation. What was wanted was a light source with twice the penetrating power of existing lamps. A new super high-intensity, carbon-arc lamp was designed to fill this demand.

It should be noted that the first change from a preponderance of carbon arcs to a preponderance of incandescent bulbs was made possible through a change in film sensitivity. The next revolution in lighting was the result of the film sensitivity of the new Technicolor process. In each case one type of light source was almost superseded by the other, until management pressure was relaxed giving the cinematographer a chance to fit the units in where they could be used for the greatest dramatic effect.

"Economics" the Watchword

The next revolution came during 1950 when, due to loss of revenue, the carbon arc, because of manpower requirements, was singled out as the "heavy" in the melodrama of economics versus production values.

Higher-powered incandescent lamps were demanded, a lamp that would produce twice the light and twice the penetrating power. The result was a revival of 10-kw lamps adapted to optics improved beyond ones that had been tried before, plus the wide usage of the highest-powered, carbon-arc lamps filtered to the spectrum of the incandescent lamp.

Penetrating Power, Light Output

An occasional cinematographer ventured color production on a white-light basis, but on the whole he remained with the tungsten balance because of so-called economics. He now wanted a lamp with the penetrating power and light output of twice that of the highest-powered, carbon-arc lamp, but with the color temperature of the incandescent lamp so he could use it on his sets freely

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"Freedom of Choice" Vital

What he actually needs is more freedom of choice for the improvement of production values rather than for small economic squeezing which robs him of the initiative it takes to make something *differently the same.*

Now comes the revolution of 3-D and wide screen with requirements of smaller lens apertures, much larger sets and the extreme in production values. As always, more light, the maximum of latitude of operation, and the extreme in creative ability will be needed. If history repeats itself, as the pendulum swings toward fewer and better pictures, the choice of set-lighting equipment will again revert to the man who directs the use of it and he will be casting about for a controllable light source with twice the light output and twice the penetrating power of any existing equipment, whether it be incandescent tungsten, carbon arcs, or some other form of radiant energy.

New Victor 16-mm Amplifier

Victor Animatograph Corp. has introduced a new high-quality 10-watt amplifier to be used with its 16-mm sound-film projector (Assembly 10). The amplifier is a 50-60 cycle, A.C., Class O A1. push-pull unit, using a five-tube compliment, plus receiver.

With less than 2½% harmonic distortion throughout the full film range, the frequency scale is said to be within ± 2db from 100 to 6000 cycles. Signal-to-noise ratio is a minimum of 4 db. A special feature of the amplifier is a built-in compensating gain designed for proper sound reproduction of old film with opaque soundtracks. By turning the volume control past "Hi," this extra gain is realized.

Closed-Circuit Tv Hookup Is Expanded by TNT Firm

Large-screen television projection equipment, specially designed for use in closed-circuit big-screen Tv presentations at hotels, has been purchased by Theatre Network Television from General Precision Laboratory. The transaction includes 50 units which will be used to link meetings taking place in the same number of cities. This new network will augment the hookup to 100 theatres throughout the country which are now used by TNT to present sports events and other attractions over theatre Tv.

Closed-circuit Tv has up to now been handicapped by the absence of good equipment in sufficient quantity for use in hotels which accommodate medium-size audiences and are available at hours not practical for large film theatres.

Cinerama As U.S. Ambassador

Cinerama has had such a universal appeal wherever it has been shown in this country that the U. S. State Department is considering it as an ideal propaganda medium for use abroad. Plans are underway to present "This Is Cinerama" in Bangkok, Siam, regarded as a critical area so far as the maintenance of American prestige is concerned.

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Rochester, New York

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Downward Trend Reversed

National figures on both gross box-office revenue and individual attendance indicate that the motion picture business is reversing the downward trend which began in 1946. Gross income for this year, 1954, is expected to reach $1,191,200,000, which would be a jump of $183,700,000, or 18%, over 1953.

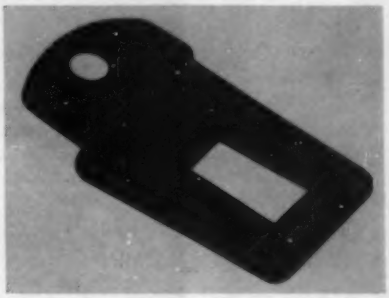
The *total number* of admissions to theatres is also rising. Ticket purchases during the second quarter of 1954 exceeded the same period in 1953 by 42,900,000, indicating a rise of 7½%. This same rate of improvement continued in the third quarter. Attendance had been dropping steadily for years. After hitting a all-time record weekly average of 82,400,000 in 1946, it steadily fell off until it reached a low of 45,900,000 weekly average in 1953. This year's figures reversed the trend.

The improvement in attendance, although smaller than the gain in gross box-office revenue, is probably more significant because the gain is in part the result of increased admission prices.

According to the Committee of Motion Picture Organization, which compiled these figures, only 44% of the estimated gain in box-office revenue during this year can be attributed to higher attendance; 56% is said to result from that part of the reduced Federal admissions tax which exhibitors have retained as part of admission prices.

Aperture Plate by LaVezzi

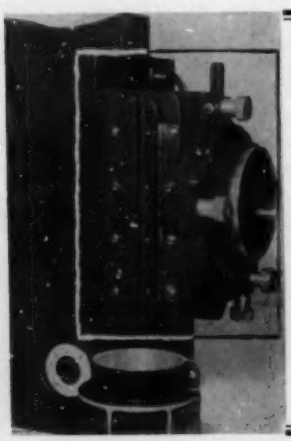
A new spring-loaded aperture plate, designated as the SP-672-E series and for use with either the standard or Super Simplex projector mechanisms has just been introduced by LaVezzi Machine Works. This new device, which replaces both the regular P-672-E aperture plate and the P-445-E sliding piece, is an assembly of the aperture plate and a blue tempered spring steel wedge which holds the plate firmly in place in the film trap.



The new spring-loaded aperture plate now available from LaVezzi.

Purpose of the new part is to eliminate the need for handling two plates each time the aperture is removed and to make changes from one aspect ratio to another faster and easier. Also added is a new finger-grip bend on the plate to facilitate rapid removal. The aperture plate is available in all aspect ratios for regular and CinemaScope projection, and are on display at theatre equipment dealers everywhere.

Further details are available from LaVezzi at 4635 West Lake St., Chicago.



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VISTAVISION ON THE MOVE

(Continued from page 12)

many projectors are either in focus on right screen, or on left screen, but never in focus on both.

In the writer's opinion, all projectors for large-theatre and drive-in presentation should have water-cooled gates, preferably water-cooling in the lamphouse air-cooling of the film, and a high-velocity jetted air stream to minimize film buckle in the gate.

This jet of air is a *must* if we are to get sharp pictures on screens of 45 feet and wider—and with standard lenses with a focal length of 3 inches or under; or, in the case of anamorphics, if the accompanying lens is 6 inches or under.

We at Paramount find that the old tolerances, regarding weave, picture jump and flicker, are inadequate for real good quality on very large screens. Much work should be done on flicker, which is probably one of the most annoying things now existent in motion picture projection.

Paramount recognizes the problem of the projectionist. He is further from the screen than any of the audience. His is the worst place in the theatre in which to do the focusing. Focus indicators and automatic focusing devices are being worked on by Paramount. We hope that these units will assist and simplify the job of the projectionist.

Much has been said and written about aspect ratios. The fact is there is much more latitude in aspect ratios than most people realize. The Paramount product is photographed to play best at an aspect ratio of 1.85/1 and 1.66/1. It will also play to good advantage at 2/1, or down to the old 1.33/1 (4/3). These are positive and fixed figures, and it probably would be better if we would stop talking "aspect ratios" and fill the proscenium with picture. We should determine the best screen shape for the theatre and in so far as possible mold the product into this plan.

The writer has recently visited theatres in most important cities in the United States, and along with his assistants has visited theatres in all principal cities around the world. We find that if the theatre has adequate screen lighting for other products, it also has adequate lighting for the presentation of VistaVision pictures.

The VistaVision demonstration, recently held in the Music Hall, on a screen 70 feet wide by 38 feet high, used standard projection equipment with standard lighting equipment, projecting on a flat, wide screen.

Adequate Screen Illumination

In most theatres, the writer has reduced rather than increased the lamp current. This is especially true with the double-frame projectors such as are now being used in The Music Hall, New York, and the Warner's Beverly Theatre in Hollywood, where we are presenting "White Christmas" by the double-frame projection system.

Data that has recently been published would indicate that the Paramount system will not work and that with VistaVision there will be a great shortage of screen illumination. This data is incorrect, as related to VistaVision. I am sure the writers of these articles have never worked with VistaVision, or the data that is published would be different.

Paramount is not anti-any system. At all our demonstrations we have

REPLACE APERTURES QUICKLY with the NEW LaVezzi SPRING LOADED APERTURE PLATE!

For Standard and Super Projectors. Remove one aspect ratio plate and replace with another—zip-zip—that quick! The blue tempered spring steel wedge holds plate firmly in place and the new finger grip facilitates rapid removal. Eliminates the P-445-E Sliding Piece.

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for CinemaScope

paid tribute to the good that has been done by Cinerama, Cinemascope—and even 3-D. We have not necessarily agreed with the techniques used, but we are most emphatic in our feeling that each has contributed to the general advancement of motion pictures.

With respect to sound, there have been many techniques proposed. Paramount joins with those who have questioned the dollar-rate-per-dollar investment in the case of elaborate stereophonic installations. All Paramount VistaVision pictures will carry Perspecta stereophonic sound for those theatres that wish stereophonic sound. These same prints will play on any standard optical sound reproducer any place in the world.

In the writer's opinion, if as much money would be spent in improving optical sound as has been spent on magnetics, we would have a far better product today. We anticipate making the same quality improvement in our optical sound that we have made in our picture quality.

Optical Sound Quality Lauded

Paramount will use optical sound on all double-frame prints. The film speed will be 180 feet per minute and tests indicate that the sound quality will be equal or superior to that which can be obtained by magnetic. Magnetic sound can of course be used with the VistaVision process, if any other company should so elect.

Looking to the future, the Paramount program is well formulated. We see no reason to make any major changes and we contemplate a long continuance of this program. Most theatres have installed large screens and many theatres have good projection equipment. This makes our Paramount group very happy, since these theatres can join the VistaVision family without spending a cent. We are preparing a booklet on VistaVision presentation and theatre standardization. Our aim is to help you to do a beter and simpler job in the presentation of all types of motion pictures.

WIDE-SCREEN PROCESSES UP INHERENT DEFECTS

(Continued from page 10)

bearing by loosening the 2 set-screws (but do not disturb the screws that hold the bearing, itself, in place).

4. Place the sprocket-cover-star assembly on a V-block, the V-indentation contacting the sprocket-hub midway between the two taper pins. Make sure that the large ends of the pins point downward, and that the sprocket and shaft are firmly and evenly supported.

5. Drive the pins out either with a pin-ejector or with a small drive-punch and a light peen-hammer, using light blows to avoid damaging the parts. The starwheel shaft is then pulled out of the sprocket and out of the cover bearing.

Reassembly a Delicate Job

6. Clean the starwheel shaft and the bore of the new sprocket, and lightly oil each surface. Run the star shaft back and forth in the bore of the new sprocket several times to make certain that the fit is not too tight for final assembly. If the fit is somewhat tight, use a twisting motion, but never apply force obliquely to the star shaft. And never pound the shaft into the sprocket! A sprung star shaft makes the sprocket wobble and the picture dance 6 times each second.

7. Reassemble the parts, and line up the taper-pin holes with a taper-pin reamer. After each of the two pins is inserted, place the assembly on the V-block and tap the pin securely into place with light blows—but avoid violent pounding! Cut off any excess length of pins that may interfere with the film-stripper.

8. Restore the outboard-bearing collar, and check the end-play of the starwheel shaft. The shaft should have only enough end-play for running clearance—no more.

9. Replace film-stripper.

10. Replace gasket on the rim of the case,

Best Wishes

Projectionist Local No. 486

I. A. T. S. E.

Hartford, Conn.

Season's Greetings

PROJECTIONISTS LOCAL 414

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aligning all holes. Prepare to replace cover, making sure that the locating pin and corresponding hole are in line, and then *very gently* engage one of the curved sides of the starwheel with the curved surface of the cam, at the same time entering the cover-pin into the hole in the cover. Replace retaining, oil-drain, and clamp screws, with clamps, and tighten evenly all around.

11. Turn the flywheel with the fingers to test the "feel" of the movement. If (a) the movement clicks when the sprocket starts to move, if (b) the movement binds when the sprocket is in the locked position, or if (c) there is backlash in the sprocket when in the locked position, the cover-screws must be loosened and the movement adjusted as follows:

12. Turn the flywheel until the star is in the locked position. Then hold the movement horizontally so that the ring of the cam rests upon a curved side of the star-wheel, and allow the cover to settle by its own weight, causing better contact between star and cam. The cover retaining-screws are then tightened securely.

The intermittent movement is put back into the projector by reversing the procedure given for taking it out. To preserve the timing of the shutter, however, the gears must be meshed in their original relationship. This will automatically occur if the projector is not disturbed while the intermittent was out; otherwise reference to "dot" punchmarks and "O" marks on gears and flywheel must be made. This expedient is less trouble than readjusting the shutter.

1. Mesh the intermediate gear with the flywheel gear so that the white dot (or punchmark) on the intermediate gear is adjacent to the little "O" mark on the intermittent flywheel.

2. Swing the body of the intermittent movement so that the oil-tube assumes the same position it had when the movement was removed.

3. While holding the intermediate and flywheel gears in mesh, insert intermittent into mechanism. At the same time, insert the intermediate-gear shaft into its bearing, aligning the hole in the rim of the intermittent case with the pin in the framing ring, *pushing the intermittent movement in, but not so far as to mesh the intermediate gear with the vertical-shaft gear.*

4. Now turn the vertical-shaft gear by means of the shutter shaft so that the "O" mark on the vertical-shaft gear-collar faces you. Then turn the intermediate gear, keeping the mesh with the intermittent, so that the white dot (or punchmark) on the intermediate gear (which has been adjacent to the "O" on the flywheel) is now aligned with the "O" on the vertical-shaft gear.

5. When in this position, mesh the gears by pushing both intermediate gear and intermittent movement all the way in.

6. Set the two intermittent-movement clamps on the operating side and tighten the clamp-screws, and replace intermediate-shaft retaining collar, allowing only a very slight amount of end-play in the intermediate-gear shaft.

7. Turn the mechanism by means of the shutter-shaft knob to note the "feel" when the intermittent sprocket stops and starts. There should be no clicking when the sprocket starts to move, and the mechanism should not bind when sprocket is in the locked position.

8. The head is still disconnected mechanically from the sound reproducer and motor, so return main drive gear. Also replace "spot" sight-box and *fill the intermittent with the required quantity of fresh oil.*

Don't forget the oil, because without it the movement will bind after just a few hours or days of running and be utterly ruined. A dry intermittent binds with startling suddenness. All seems to be well one moment, and the next moment the intermittent emits an ear-splitting scream and stops dead. The main drive-gear usually strips, and sometimes the spiral shutter-gear, also. Failure of the drive gear to strip may result in serious damage to sound-head gears and motor. And all because somebody forgot to oil the intermittent!

9. As an added precaution, turn the projector over by hand a few times to make ab-

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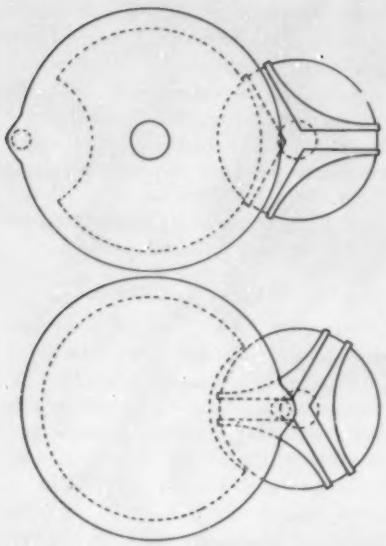


A Geneva type 5-to-1 movement. This intermittent is workable, but has two disadvantages—terrific leverage during pull-down, and the necessity for using a small 12-tooth sprocket which might damage sproket-holes.

solutely certain that everything is free before turning the motor on. This is a good time to check the timing of the shutter, correcting any minor misadjustment by means of the shutter-timing knob. Then "run in" the projector several minutes, listening carefully to make sure that the intermittent runs quietly *with the gate door open.* The movement should barely whisper—if it clicks or whirs loudly, then it must be taken out again and readjusted. Naturally, it will make a slight whirring sound when the gate door is closed, and a louder noise when film is run. Finally, project a reel of film. If the picture looks good, then the machine is in perfect condition for the next show.

Later-Model Projectors

To change sprockets in the Simplex E-7, the gear side of the mechanism need not be touched except to remove the sound drive-gear for the purpose of turning over the freed mechanism by hand to get the "feel." The cover of the intermittent-movement case may be removed from the operating side, after taking the film-gate out, but the oil has to be drained from the movement while it is in the machine, and this is admittedly a messy job. The oil must not be permitted to seep into the sound-head.

Any construction which requires disturbance of the fussy star-and-cam adjustment merely to change the sprocket must be considered obsolete today. Such excellent modern projectors as the Simplex X-L and the Motiograph AA enable the projectionist to change intermittent sprockets in a matter of a couple of minutes by merely removing the outboard bearing from the operating side of the projector. The RCA Brenkert Models 40, 60, and 80 come closest to such standard European machines as the Ernemann, Bauer, Askania, Aga Baltic, Mikrotechnika, etc., in regard to ease of sprocket-changing. In the Brenkert projectors it is only necessary to swing the film-stripper out of the way, remove the "locking plate" at the end of the sprocket, take out the end-fastening screw, and slide the sprocket off the shaft with the fingers.

The long and complicated directions given above for sprocket-changing on the older Simplex-type mechanisms will undoubtedly astonish projectionists overseas who are unacquainted with these machines, and who are accustomed to removing the intermittent sprockets even for routine cleaning.

Loyalty to Old Machines

But many American projectionists regard these old-style machines with tender attachment, the result of many years of experience with them. And if ever the starwheel or cam should get badly worn in one of these old projectors, the projectionist who knows how to change intermittent sprockets would encounter nothing new in the task of replacing the inner parts. He already knows how to take the intermittent movement apart and put it together again.

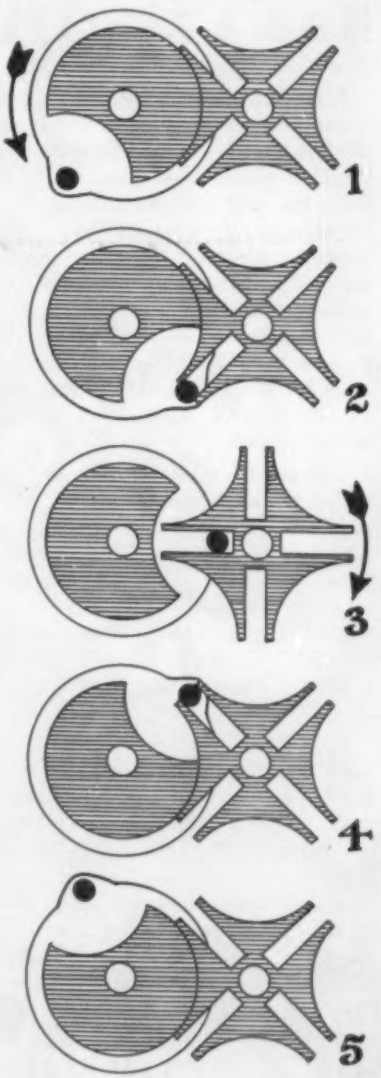
It is not always necessary to replace a worn intermittent sprocket with a brand-new sprocket. If only one side of the teeth shows the characteristic notching caused by wear, the sprocket may be reversed to make use of the other side of the teeth. Only when both sides of the teeth have been used is it necessary to install a new sprocket. Many projector manufacturers encourage this economy.

Sprocket-Tooth Noise

Worn sprocket teeth may be detected by passing a sharp knife-blade over the underside of a tooth—a "click" indicates a notch worn into the base of the tooth. Several consecutive teeth should thus be tested, for different teeth of intermittent sprockets wear by different amounts. It is ordinarily found that every fourth tooth shows approximately the same amount of wear, while the teeth in between show either less or more wear.

Notched sprocket teeth tend to make the film adhere to the sprocket, hence the tearing noise as the film pulls away. Not only are the film perforations "checked" and otherwise damaged, but the projected picture will very likely have an unsteadiness greater than the maximum "jump tolerances" previously given—10 microns for the standard 1.37/1 aspect ratio, 8.28 microns for the wide-screen 1.66/1 ratio, 7.62 microns for the wide-screen 1.85/1 ratio, etc.

While picture-unsteadiness may in some cases be due to mechanical vibration of the projector, a loose lens, or other causes external to the intermittent movement, all jumpiness due



Operational principle of the conventional Geneva intermittent movement, standard in 35-mm projection today.

to a faulty intermittent or other causes of film mis-registration at the aperture (such as insufficient or uneven gate tension) may be measured percentage-wise.

Each pull-down of the film over the aperture amounts to 1 frame. The length of 1 frame of film is ¾ of an inch (19 mm.). If each pull-down is *exactly* 0.75 inch, the picture on the screen will be perfectly rock-steady if the film is properly photographed and printed; but if the succeeding pull-down distances vary slightly from frame to frame, the picture will be unsteady. We have already seen that the maximum registration-variation permissible in standard projection is 10 microns (0.39 mil.). This is a variation of 0.052% of the total 0.75-inch pull-down distance.

The European Outlook

Many European projector manufacturers furnish pull-down variation figures for their machines, thus permitting prospective purchasers to judge the quality of the various makes of projector. This practice also sparks competition, which goes to increase the quality of all European machines. American manufacturers might well follow their example, even though practically all American projectors are made by only three companies, one of which is a combine producing several makes.

Just as the intermittent pull-down variations must not exceed 0.052% when the standard aspect ratio of 1.37/1 is used, the permissible variations are even smaller in non-anamorphic wide-screen projection—0.044% for the 1.66/1 ratio, 0.040% for the 1.85/1 ratio, 0.036% for the 2/1 ratio, and 0.029% for the 2.5/1 ratio.

The dimensions of the starwheel and cam have a great deal to do with the accuracy of an intermittent movement. The wider the running surfaces, the longer these parts will last, assuming that they are properly made of the best metals and given good care by the projectionist. And when the diameters of star and cam are oversize, unusually high accuracy of performance is attained even when these parts are finished to ordinary manufacturing tolerances.

The Brenkert Method

The American Brenkert projector resembles many European machines in the large size of the star and cam. (The steel *roller* pin of the cam is another excellent European feature of the Brenkert.) The tolerances held in Brenkert intermittent parts are under 0.05 mil (1.27 microns)—often only 0.04 mil (1.02 microns). This close tolerance is equivalent to about 0.035 mil (0.89 micron) in the usual smaller-size stars and cams.

The life of the projectionist is filled with surprises. Among the different projectors tested by the writer in gathering data for this article was one (not old-fashioned, but nevertheless no longer in wide use) which has an intermittent manufactured to the rather large tolerance of 0.2 mil (5.08 microns). This tolerance seems almost too great for satisfactory intermittent action. It is conceivable that the errors in starwheel, shaft, and sprocket could "add" to produce registration-variations as great as 0.6 mil (about 15 microns). This is 1/3 greater than the permissible misregistration of the film in standard projection.

A Surprising Circumstance

Strangely, that make of projector, though not so accurately made as most others, projected a picture as rock-steady as any that the writer has ever seen. Picture-steadiness was measured on a 50-foot drive-in screen, and no unsteadiness—not even a trace—could be detected in the picture produced by either of the two projectors of the installation!

A machine which gives a steadier picture than might seem possible from a consideration of its constructional details is infinitely less damaging to the welfare of the exhibition industry, however, than a "good" projector which, through carelessness, mishandling, or neglect, fails to deliver the rock-steady, lifelike images which present-day audiences have come to expect of the theatre screen regardless of the aspect ratio. It's time to check—and to correct, if necessary.

[THE END]

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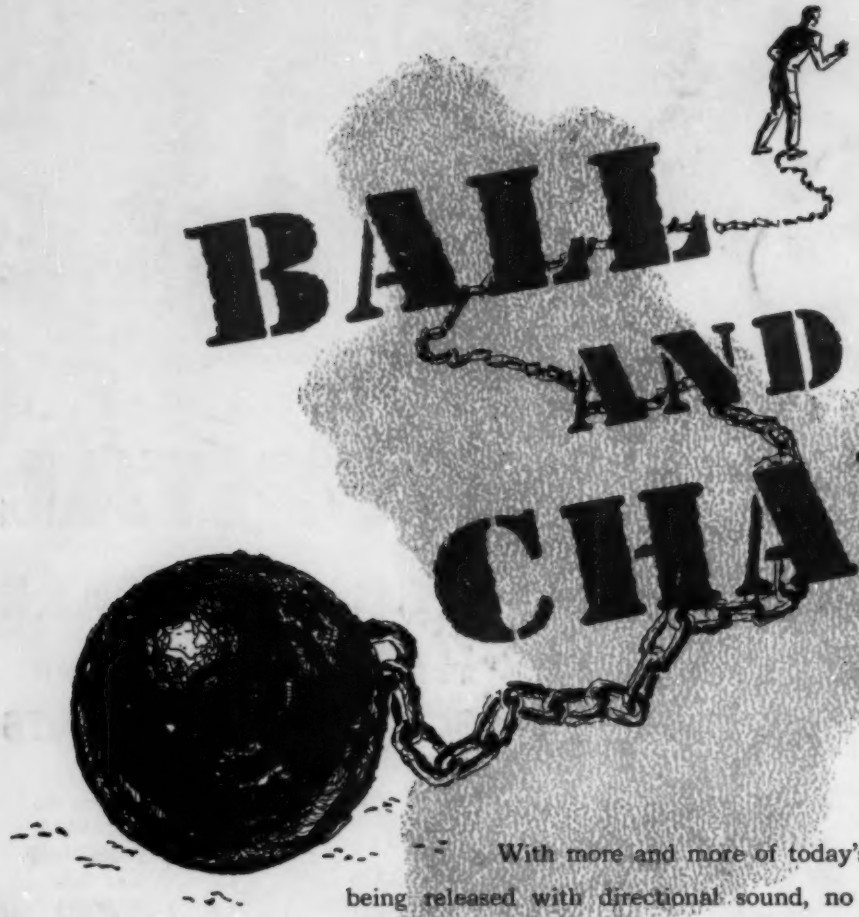

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